GENERAL LIBRARY
JUL 2
UNIV. OF

Railway Age

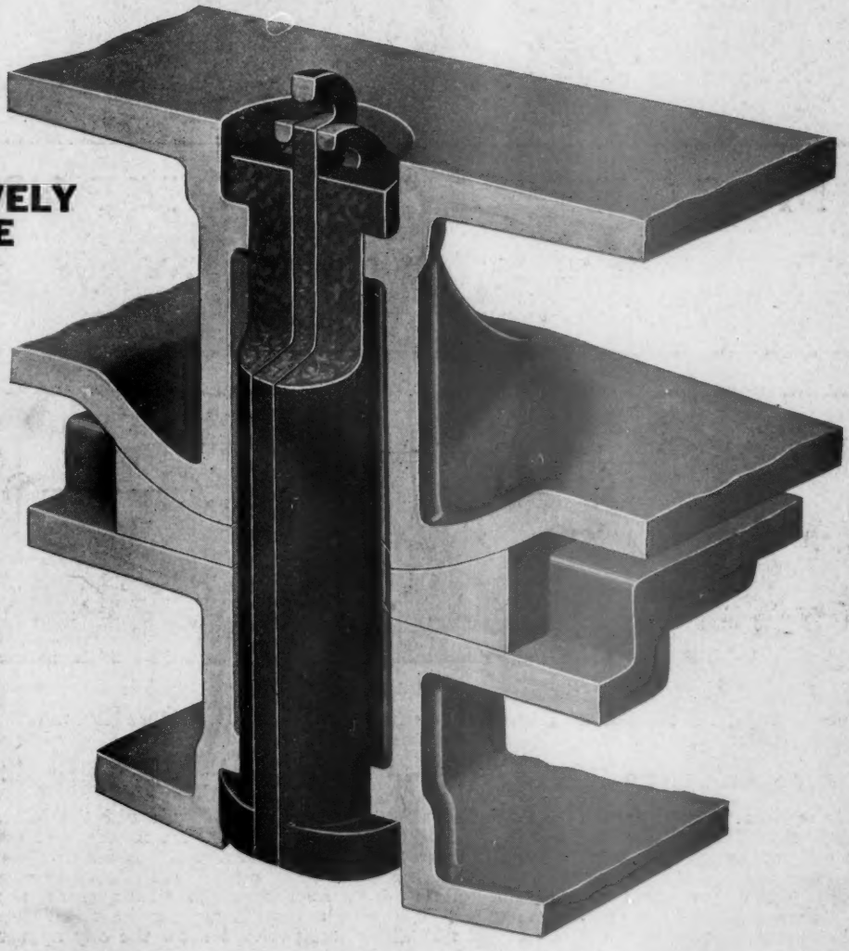
DAILY EDITION

FIRST HALF OF 1919—No. 25f | NEW YORK—THURSDAY, JUNE 26, 1919—ATLANTIC CITY | SIXTY-FOURTH YEAR

Published weekly by Simmons-Boardman Pub. Co., Woolworth Bldg., New York, N. Y. Subscription Price, U. S. and Mexico, $5.00 a year; Canada, $6.00; foreign countries (excepting daily editions), $8.00. Entered as second-class matter, January 30, 1918, at the post office at New York, N. Y., under the act of March 3, 1879.

COLEMAN BOLSTER LOCKING PIN

EXTENSIVELY IN USE



INSURES SAFETY WHEN CARS ARE DERAILED. ALSO PREVENTS TELESCOPING

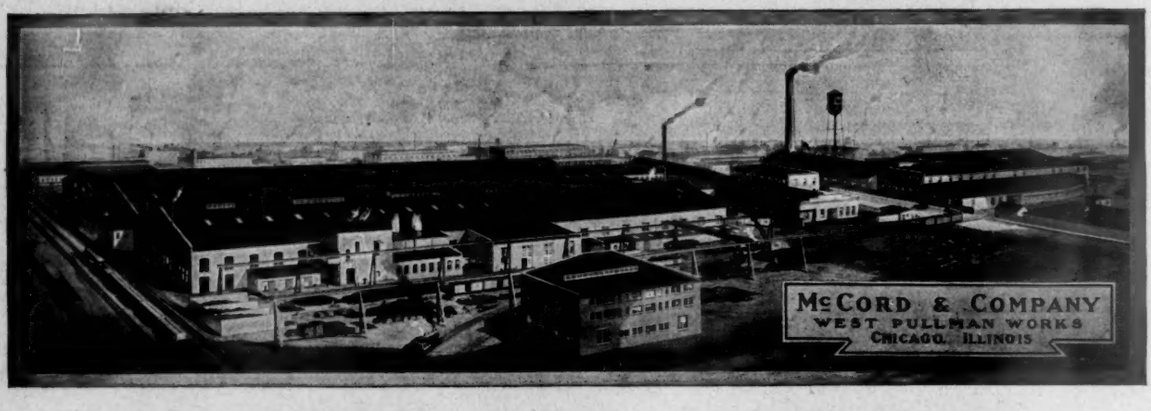
PIER SPACE 584-585

W.H.MINER CHICAGO

Alphabetical Index to Advertisements, Page 78

McCORD AND COMPANY

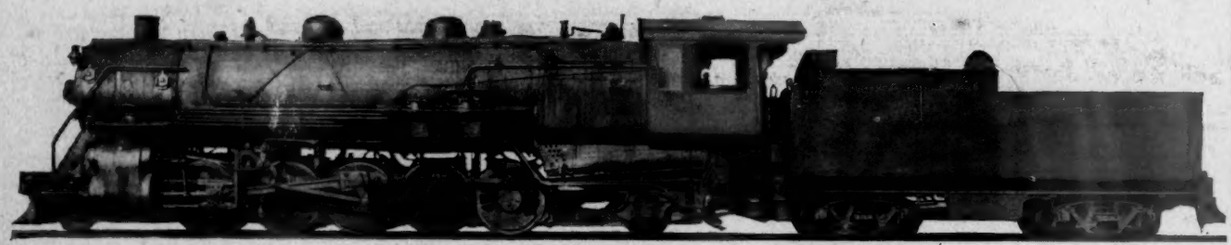
Electric Steel Castings
Electric Manganese Steel Castings
Pressed Steel Shapes
The McCord Journal Box



McCORD AND COMPANY

THE HOLDEN COMPANY

Chicago Montreal New York



The engineer is a good barometer of a locomotive's increased efficiency, because his comfort and peace of mind are enhanced thereby.

An engineer running one of the class engines above illustrated writes:—

"I have been running one of the large Santa Fe Type engines equipped with the SCHLACKS SYSTEM OF LOCOMOTIVE FORCE FEED LUBRICATION for a period of ten months and have found it to give perfect satisfaction, both in lubrication and in saving of both fuel and oil, in which time I don't believe it ever had ten minutes' attention any more than filling. Our road is such that a lubricator must work and give the best results or we would be unable to handle the tonnage over these hills, some of which are sixteen miles. These engines have made more than 25,000 miles without renewing the cylinder packing. It is rare for either pistons or valve stems to be packed. The pistons always show the oily appearance which a piston will when properly lubricated.

"One of the greatest things to be said of these lubricators is that they are a safety device, inasmuch as it relieves the engineer of looking up and away from the track and his block signals, which all of us do with the old style lubricators, which are placed on the boiler heads inside the cab and must be watched very closely that they don't feed out before reaching our terminal. It also eliminates the danger of lubricator glasses breaking, which frequently occurs with the old style lubricators. It also eliminates the breaking and bursting of tallow pipes under jacket."

LOCOMOTIVE LUBRICATOR COMPANY

BOOTH NO. 574, ATLANTIC CITY, N. J. 1202 TOWER BLDG., CHICAGO, ILLINOIS

Railway Age

DAILY EDITION

Copyright, 1919, by the Simmons-Boardman Publishing Co.

VOLUME 66 JUNE 26, 1919 NUMBER 25f

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY, WOOLWORTH BUILDING, NEW YORK.

EDWARD A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-Pres.* HENRY LEE, *Vice-Pres. & Treas.*
ROY V. WRIGHT, *Secretary.*

CHICAGO: TRANSPORTATION BLDG. CLEVELAND: CITIZENS' BLDG.
WASHINGTON: HOME LIFE BLDG. CINCINNATI: FIRST NATIONAL BANK BLDG.
LONDON, ENGLAND: 85, FLEET STREET, E. C. 4.
CABLE ADDRESS: URASIGMEC, LONDON.

EDITORIAL STAFF:
SAMUEL O. DUNN, *Editor.*
ROY V. WRIGHT, *Managing Editor.*

W. E. HOOPER, E. T. HOWSON, B. B. ADAMS, H. F. LANE, R. E. THAYER, C. B. PECK, W. S. LACHER, J. G. LITTLE, A. F. STUEBING, C. W. FOSS, K. E. KELLENBERGER, F. W. KRAEGER, B. W. MEISEL, A. G. OEHLER, HOLCOMBE PARKES, E. A. BIERY, C. N. WINTER

BUSINESS DEPARTMENT REPRESENTATIVES

C. R. MILLS, F. S. DINSMORE, F. H. THOMPSON, H. H. MARSH, F. C. KOCH, R. H. SMITH, F. J. FISCHER, J. M. RUTHERFORD, H. L. BURRHUS, J. P. RISQUE

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free; United States and Mexico, $5.00; Canada, $6.00; Foreign Countries (excepting daily editions), $8.00 (£-15s;-0d.); single copies, 15 cents each. Subscription Agents for Great Britain and Egypt: The Dorland Agency, Ltd., 16 Regent Street, London, S. W. I.

WE GUARANTEE that of this issue, 15,925 copies were printed; that of these 15,925 copies, 15,406 were mailed to regular paid subscribers to the Railway Age and the Railway Mechanical Engineer; 119 were mailed to advertisers, 300 were provided for counter and news companies' sales, new subscriptions, bound volumes, copies lost in the mail and office use, and 100 copies for distribution at Atlantic City.

THE RAILWAY AGE is a member of the Audit Bureau of Circulations (A. B. C.) and the Associated Business Papers. (A. B. P.)

Regulating Cut-off for Maximum Horsepower

The method of regulating cut-off with variations in speed in such a manner as to develop the maximum capacity of the locomotive, proposed in the individual paper by B. B. Milner, represents an important step toward the realization of the highest efficiency in the operation of locomotives. The object, as stated by Mr. Milner, is to increase the tonnage hauled or the speed developed. An incidental advantage which would probably be secured by setting up standards for road performance is improvement in the general condition of the motive power. The establishment of a standard running time for trains under fixed conditions presupposes that all engines of the same class can develop the same power. That this is not true under present conditions is shown by the aversion which enginemen express for certain individual locomotives that do not perform nearly as well as the average engines of the same class. Variation in the performance may be caused by the steam generated being abnormally low, due to defects of the boiler or draft appliances, or to lack of skill or energy on the part of the fireman. The condition of the machinery also influences the performance of the locomotive if it affects the steam consumption per unit of work. As an indication of the extent to which these defects may reduce the efficiency of the engine it is of interest to note the results of tests reported at the last Fuel Association convention. These investigations showed that a locomotive with valves out of square but no more than is found in ordinary practice, used from 8 to 21 per cent more coal per ton-mile than it did when the valves were properly set. If a standard performance was set up, failure to meet the requirements would lead to an investigation of the condition of such locomotives leading to higher maintenance standards. Thus the method proposed by Mr. Milner might bring about important savings in both wages and fuel.

Where Are the Younger Members?

The small number of men who have participated in the discussion has been very noticeable at the convention. A few of the past officers of the associations have spoken on practically every subject presented, and others have discussed matters in which they were particularly interested, but very few of the younger members have been heard on the floor during the meetings. Surely the rising generation is not devoid of ideas, but it seems to be extremely timid. It might be well for the officers and the older members to make a special effort to get young men to take an active part in the affairs of the Mechanical Section. There are at present many prominent members of the old associations who are represented on several committees. The majority of these men hold high positions and are extremely busy, so that necessarily they cannot give personal attention to committee work, and as a result it is delegated to their subordinates. The experience of attending committee meetings and doing the work on their own initiative would be of value to the younger officers who will be the future superintendents of motive power, and all involved should benefit if the amount of overlap in the committees of the Mechanical Section was reduced.

Equipment for Terminal Brake Tests

During the discussion on the report of the Committee on Fuel Economy and Smoke Prevention in Tuesday's session the importance of properly maintaining air brake equipment in order that the loss of fuel due to air leakage may be reduced to a minimum was brought out by several speakers and reference was made to the desirability of adhering strictly to the train line leakage limit of five to eight pounds advocated in Fuel Conservation Circular No. 13. Adherence to this circular is not only important from the standpoint of fuel economy and of the expense entailed by excessive train line leakage, but from the standpoint of safety as well. Strict adherence to this rule, however, in making terminal tests not infrequently results in the necessity for a large amount of switching in cutting out cars which cannot be made to meet the requirements without a visit to the repair tracks. It is evident, therefore, that the use of the road locomotive to charge the brakes for these tests results in the use of considerable fuel as well as in extensive terminal delays and overtime for the crews, and they also increase boiler maintenance. These delays and the entailed expense can be eliminated by the installation of terminal equipment for charging the train lines during the test, the necessary switching being performed by yard engines instead of by the road locomotives. Where such plants have been installed the saving effected has in some cases been found to offset the original cost of the installation within a year. Furthermore, they will undoubtedly tend to increase the effectiveness of the terminal tests. With a road locomotive attached to the train the incentive is very great to slight the test where conditions are bad, rather than to subject the train to

the exessive delay which would be required to cut out or make repairs necessary to bring the leakage within the limits.

Painting Steel Cars

THERE IS ONE PHASE of the maintenance of equipment that is badly neglected; that is the painting of steel cars. Much more attention can be given to the protection of both the bodies and underframes than is now being done, with big returns in added life for the cost of the material and labor used. Many difficulties are in the way of adequately protecting the interior of open top cars, owing to the abrasive action of the lading which these cars handle. This condition, however, is no excuse for neglecting the exterior and does not even justify failure to give atention to the interior as opportunity presents itself. The cost of paint application by spraying is small and the deterioration of the unprotected steel takes years off the life of the car. War conditions have been responsible for the cutting of many corners in maintenance, and the attention once given to painting has been one of the things which has suffered seriously on that account. Bad practice, once started, is very easily perpetuated and on that account special care should now be exercised to see that better conditions are restored.

The economic phase of this subject was clearly brought out in a study made several years ago by M. K. Barnum and reported in the *Railway Age Gazette* of March 3, 1916. The investigation developed that $30 or $35 spent for enough additional paint to preserve the protective coat might be expected to increase the life of the car by as much as a third of its life. Furthermore, the actual cost of painting was found usually to be greater where the cars are most infrequently repainted.

This matter was also investigated by a committee of the Master Car Builders' Association in its report to the convention in 1908, which emphasized the necessity for taking proper care of the exterior of the cars. This fact would indicate that there is no lack of appreciation of the value of paint on the part of car department officers, but their recommendations have failed to receive the approval of the managements, probably because no immediately apparent ill effects followed the practice of inadequately protecting the steel. Failure to have recommendations in this matter accepted immediately is no reason why continued effort should not be made to have it understood by the managements in its proper light and it is the duty of car department officers to make every possible effort to present it in such a way that the ultimate return for the money expended in better protection may be so evident that the necessary approval of proper practice will be forthcoming.

Innovations Which Should be Continued

THE FIRST ANNUAL CONVENTION of the Mechanical Section of the American Railroad Association has broken all records of previous conventions of the Master Car Builders' and American Railway Master Mechanics Associations in attendance, in the extent and character of the exhibits, and in the interest which has been taken, both in the proceedings and the exhibits. The Convention Hall has been filled at practically every session.

A number of innovations have been introduced this year. The entire membership of the executive committee of the American Railroad Association, including some of the foremost railway executives of the country attended the convention and inspected the exhibits. W. T. Tyler, director of the Division of Operation of the United States Railroad Administration, addressed sessions of the convention during both weeks. The chief of the Russian Mission of Ways of Communication gave the Mechanical Section a very interesting talk on the nature of the similar organizations in Russia. A record has been kept of those in attendance at each session.

These innovations have all added greatly to the attendance and interest in the convention and have been a means of real inspiration to the members. They are innovations this year, but why should they not be considered as precedents to be followed next year and at succeeding conventions? The practice of collecting registration cards at each session is a good one and should be kept up. If the members are once induced to attend the sessions consistently they may in time acquire an interest in the affairs of the Section which will make the association of greater value to them and they will become an asset to the association.

The mechanical departments of the railroads have never been accorded the recognition which their importance justifies. This has been due largely to a lack of understanding and appreciation of the scope of the work of the departments. The visit of the railway executives at this year's convention has done much to correct erroneous impressions as to the value of the work which the mechanical associations have been doing, and a visit to the exhibits alone is sufficient to inspire a high appreciation of the great variety and scope of the problems with which the mechanical departments have to deal. But what is of even greater importance is the inspiration which the interest manifested by these men in the Mechanical Section has been to the members and the higher respect and feeling of greater responsibility which they will feel individually toward the association. The practice of inviting such men to attend the sessions is a good one and should be followed up consistently.

The world war has broadened the interests of people in every civilized nation in affairs outside their own countries. It would be an excellent idea if representative foreign railway men can be induced to appear before the Mechanical Section at each year's convention to deliver short messages on the problems of other countries. The result could not help but be broadening.

The large attendance this year places a great responsibility upon the officers of the Mechanical Section to see that everything possible is done to retain and increase the interest of the members in its affairs. It is a notable fact that in spite of the large attendance, participation in the discussions was largely limited to a small group of the older and better known members. The value of the association to the members is measured largely by what they put into it and every possible effort should be made to induce the younger and newer members to enter into the discussions. The value of the discussions can also be increased if those who take part know how to do so most effectively. It is difficult to retain interest and follow the proceedings when, for instance, a member near the front of the hall faces the chairman, with his back to the rest of the audience. Could not printed instructions be issued, giving briefly the essentials of effectively addressing the convention, in order that what is said may be heard by those in the hall?

A bigger hall is needed to accommodate the Section if the present large attendance is to kept up and increased and more suitable arrangements in several respects should be made.

The officers of the section who have been responsible for the arrangements this year are to be congratu-

lated on the excellent results which they have secured. A large measure of this success is due especially to Secretary Hawthorne for the work he has done in the securing of almost complete advance distribution of the reports and papers this year. The convenience of the members in attendance has been greatly facilitated by the method in which the advance copies have been distributed at each session. The distribution of the papers for each session enclosed in an envelope not only avoids waste, but saves the members considerable annoyance in not having to hunt through a complete list of the papers for the whole convention, to locate each report as it comes up. The success of any association depends to a large extent upon the secretary and the way in which the affairs of the office have been conducted this year is sufficient indication that the association is in good hands.

The exhibits this year have been of exceptional value and the only return the members of the Railway Supply Manufacturers' Association receive for the trouble and expense entailed in assembling them is the interest which is manifested in them. A general feeling of satisfaction has been evidenced in this repect. No railroad man in attendance can return home without having secured much information which is of immediate or future value to him, if he has taken advantage of the opportunity which the exhibits offer. The practice which has been followed this year of calling for reports on the exhibits visited should be continued, if for no other reason than because it requires the visitor to review and analyze what he has seen.

Rolling Stock Conditions in Belgium

By Robert E. Thayer.

(European Editor of the *Railway Age.*)

BRUSSELS, June 2, 1919.

IF THE MECHANICAL MEN of the railways in the United States are at all discouraged with regard to the condition of the equipment on their roads they need only come to Belgium to find out what "bad conditions" really are. There are no figures here showing "percentage in bad order." If there were it would be very nearly a 100 per cent record with probably 25 per cent running. Locomotives are being run on the "crack" trains—to use a pre-war term—which would give the boilermaker a very satisfactory shower-bath when he entered the firebox. In America we speak of crown bolts "weeping." The word "crying" would apply much better here to-day, and the tears would be crocodile tears at that, with every appearance of a miniature rainstorm. And yet both the engineer and fireman referred to the engine as a "bonne locomotive." In other words, the equipment situation in Belgium is beyond description. One must see to adequately appreciate what the conditions are. It is a wonder men can work under such conditions.

At the beginning of the war the Belgian State Railways had in the neighborhood of 4,500 locomotives, 10,000 passenger cars and 94,000 freight cars—perhaps "wagons" is better after all, they are so small. To-day they have 4,000 locomotives, of which 1,615 were "picked" from German equipment under the terms of the armistice and the rest are what the Germans left behind and what France returned out of the 2,000 sent her at the time of the German invasion in 1914. Needless to say, the condition of the locomotives remaining in Belgium and those returned from France is deplorable—and furthermore there are practically no facilities for repairing them. Those left in the country by the Germans were not only badly in need of maintenance, but quantities were left with fires burning freely and no water in the boiler! The word "picked" in reference to the German locomotives is used advisedly, for out of the first 2,110 locomotives sent from Germany under the terms of the armistice only 350 were accepted as being in fit condition to run.

The same thing is true of the condition of both the passenger and freight cars. As against nearly 10,000 passenger cars in 1914, the Belgian State Railways have only 5,500 and only 74,500 freight cars as against 94,000 in the same year. The passenger cars now running on Belgian rails were also "picked," for out of 3,530 offered last Christmas day only 1,844 were accepted and out of 60,087 freight cars only 34,134 were accepted. As in the case of the locomotives both the passenger and freight cars left by the Germans and those returned from France were in an extremely bad state of repair. The passenger cars the Germans left behind were willfully damaged in a most shameful manner. The glass windows were broken, the upholstery was ripped from the seats, the air brakes were put out of commission, electric lighting fixtures were ruined, etc., etc., ad infinitum.

To still further complicate matters the repair shops were robbed of their machines and all belting was taken as fast as the Germans were through working the shops. That is to say, the shops in the western part of the country were absolutely denuded of all shop machinery and tools, while the shops in the east, which the Germans had to use up to the time of their evacuation, suffered in proportion to the time the Germans had for their departure from the country. The shop at Ghent has only recently been re-equipped with nondescript tools gathered up here and there as they could be found and spared and will be ready for business about the middle of June.

The fact that the German equipment used by the Belgians is entirely different from their own equipment —the 1,615 German locomotives were of a great many different designs—makes it impossible to keep them all in running condition for lack of repair parts. Many of the locomotives were furnished without any drawings for them. This has added further complication to the situation.

Such is the condition of the Belgian rolling stock and it presents a most distressing problem to the railway men here. The same wanton destruction was applied to the roadway. Bridges of no military value were destroyed very completely. The signal system, while not completely destroyed, was made so unfit for Belgian use that it will all have to be reconstructed. The spirit of the railway men here with all their reconstruction tasks ahead of them is wonderful. It is hard to account for it. Perhaps they are so glad to be rid of the Germans, after four long years of their domination, that they are happy to get their country back regardless of what shape it is in. The manner in which they are attacking the problems ahead of them is characteristic of the manner in which they resisted the invasion of the Boche in the early days of August, 1914.

Mardi Gras Dance

The feature of Tuesday evening's entertainment on the pier was the beautiful sight presented after the dancers had donned their vari-colored hats and caps and the streamers and inexpensive souvenirs had been distributed. Certain it is that the Mardi Gras dance of the 1920 convention was a great success. The entire entertainment committee was in charge.

General Committee Meeting

THE GENERAL COMMITTEE of the American Railroad Association, Section III, Mechanical, held a meeting on Monday afternoon and after reorganizing, took up several important matters. Chairman Tollerton of the section, is chairman of the General Committee.

It was decided to send the various questions referred to letter ballot to the members one at a time, rather than to combine them all into one bulky communication. This will insure closer attention on the part of the members and will also make it possible to decide first upon those questions which will affect the M. C. B. rules of interchange. It was also decided that any member voting in the negative should give the reasons therefore, thus assisting the committee in charge of that particular subject in developing a satisfactory report for the following year.

The secretary was instructed to prepare a bound booklet containing biographical sketches of the past presidents, together with their present addresses.

A Committee on Committees was appointed, whose duty it will be to study carefully the make-up of the different committees and see that the men best fitted to discuss the different subjects are placed on the committees. This committee consists of T. H. Goodnow, J. S. Lentz, J. E. O'Brien, C. F. Giles and J. T. Wallis.

The General Committee approved of the election to membership in the association of the following gentlemen:

Name Title and Road Address

Barthlemy, P. P., Asst. Gen. Car Fore., Great Northern.
Beaghen Thomas, Jr., Representative, The Texas Co., New York City.
Beyer, F. A., Supt. Shops, St. Louis-San Francisco, Springfield, Mo.
Blocker, R. V., Master Mechanic, Erie Railroad, Marion, Ohio.
Bodeneet, C. J., Asst. Supt. Mchy., Louisville & Nashville, Louisville, Ky.
Brady, J. F., Supvr. Equip., U. S. R. A., Washington, D. C.
Brigham, E. D., Jr., Supt., North American Car Co., Coffeyville, Kan.
Burkhard, A. A., Gen. Fore., New York Central, West Albany, N. Y.

Caley, G. W., Master Mechanic, New York Central, New York, N. Y.
Cooper, A., Asst. Loco. Supt., United Railways of Havana, Havana, Cuba.

Davis, B. H., Master Mechanic, Delaware, Lackawanna & Western, Scranton, Pa.
Dugan, G. A., Master Mechanic, Pennsylvania & Reading, Rutherford, Pa.

Emerson, C. H., M. C. B., Elgin, Joliet & Eastern, Joliet, Ill.

Farr, B. J., Supt. M. P. &C. D., Grand Trunk, Montreal, Can.
Flood, W. D., M. M., United Railways of Havana, Havana, Cuba.

Garber, O. A., M. M., Illinois Central, Memphis, Tenn.
Gimpel, J. H., Supvr. Car Repairs, U. S. R. A., Denver, Col.
Gorman, T. F., M. M., Erie Railroad, Meadville, Pa.
Graham, A. A., M. M., St. Louis-San Francisco, Sherman, Tex.
Grimes, L., M. M. Illinois Central Jackson Tenn
Greenough Grafton, V. P., Baldwin Locomotive Works, Philadelphia, Pa.

Harmison, W. E., M. M., Erie Railroad, Kent, Ohio.
Harris, W. M., Gen. Fore. Loco. & Car Dept., Wichita Falls & North Western, Woodward, Okla.
Henderson, J., Road Fore. of Engines, United Railways of Havana, Havana, Cuba.
Hickok, W. H., Chief Insp. Car Department, Delaware & Hudson, Watervliet, N. Y.
Huber, H. G., Asst. E. M. P., Pennsylvania, Pittsburgh, Pa.

Iffla, A. H., Asst. Loco. Supt., United Railways of Havana, Matanzas, Cuba.

Jennings, J. F., Div. M. M., Michigan Central, Bay City, Mich.

Kimbell, John F., M. M., El Paso & Seattle Western, Douglas, Ariz.
Kinney, C. D., M. M., Boyne City, Gaylord & Alpene, Boyne City, Mich.
Kirkman, W. B., President, Cropley, Phillips Co., Chicago, Ill.

Langdon, H. A. W., Asst. Loco. Supt., United Railways of Havana, Sagna la Grande, Cuba.
Lightfoot, S. S., Equip. Eng., A., T. &S. F., Chicago, Ill.

McClennan, W. J., Asst. Eng. Rolling Stock, New York Central, New York, N. Y.
Martin, K. H., Gen. Equipment Insp., M., St. P. & S. S. M., Washington, D. C.
Miscampbell, J., Ft. Smith & Western, Ft. Smith, Ark.
Moir, G. B., Asst. Supvr. Equipment, U. S. R. A., Washington, D. C.
Moody, F. G., Supvr. Car Reprs., U. S. R. A., Washington, D. C.
Moody, W. O., M. E., Illinois Central, Chicago, Ill.

Needham, H. L., M. M., Illinois Central, Clinton, Ill.
Needham, R. J., Mech. & Elec. Engr., Grand Trunk, Montreal, Que.
Neesley, F. P., M. M., Michigan Central, Jackson, Mich.

Orancer, H., M. M., Seaboard Air Line, Jacksonville, Fla.
Ostrander, A. E., American Car & Foundry Co., New York, N. Y.
Owens, H., Shop Supt., United Railways of Havana, Havana, Cuba.

Pack, A. J., Chief Insp. of Locos., I. C. C., Washington, D. C.
Parsons, C. F., M. M., New York Central, West Albany, N. Y.
Peters, R. F., M. E., St. Louis-San Francisco, Springfield, Mo.

Quinnell, H. J., G. C. I., Illinois Central, Chicago, Ill.

Rankin, G. W., Asst. M. M., Louisville & Nashville, Louisville, Ky.
Rivet, R., Supvr. Car Repairs, U. S. R. A., Marinette, Wis.
Robinson, A. L., Asst. Loco. Supt., United Railways of Havana, Cardenas, Cuba.
Robinson, Lee, Shop Eng., Illinois Central, Chicago, Ill.
Romanach, J. A., Loco. Supt., Cuba Cane Sugar Corp., Havana, Cuba.

Sechrist, T. O., Asst. Supt. Mchy., Louisville & Nashville, Louisville, Ky.
Sultzker, J., M. M., Pennsylvania Railroad, Verona, Pa.
Smallwood, C. H., G. C. I., Illinois Central, Memphis, Tenn.
Smith, B. H., M. M., Chicago, Rock Island & Pacific, Fairbury, Neb.
Stackhouse, R. J., Gen. Storekeeper, Pennsylvania & Reading & C. R. R. of N. J., Reading, Pa.
Stone, W. C., Supvr. Car Repairs, U. S. R. A., De Soto, Mo.
Stuebing, A. F., Railway Age, Chicago, Ill.

Taylor, C. S., M .M. ,A. C. L. Railroad, Wilmington, Del.
Thayer, R. E., Railway Age, London, Eng.
Thompson, E. B., Asst. Eng., Chicago & North Western, Chicago, Ill.

Umpleby, C. H., M. M., New York Central, Watertown, N. Y.

Walker, J. F., M. M., Illinois Central, Paducah, N. Y.
Wallace, F. C., M. M., Erie Railroad, Port Jervis, N. Y.
Webb, E. R., M. M., Michigan Central, St. Thomas, Ont.
Whyte, Arthur, Asst. Sec., Loco. Dept., Rome Mfg. Co., Rome, N. Y.
Wilson, G. M., Supt. Motive Power, Grand Trunk, Montreal, Can.
Winter, P. G., Mechl. Eng., C., M. & St. P., St. Paul, Minn.

Extra Convention Service on Pennsylvania Railroad

THE PENNSYLVANIA RAILROAD, in order to handle the unprecedentedly large crowd attending the convention, arranged for extra service from Atlantic City over its lines Wednesday.

The train left at two o'clock and connected with the Broadway Limited, which left North Philadelphia at 4.40, had ample accommodations and it was arranged that the Broadway Limited should run in two sections if necessary in order to handle the crowd desiring to go to Chicago and other western points.

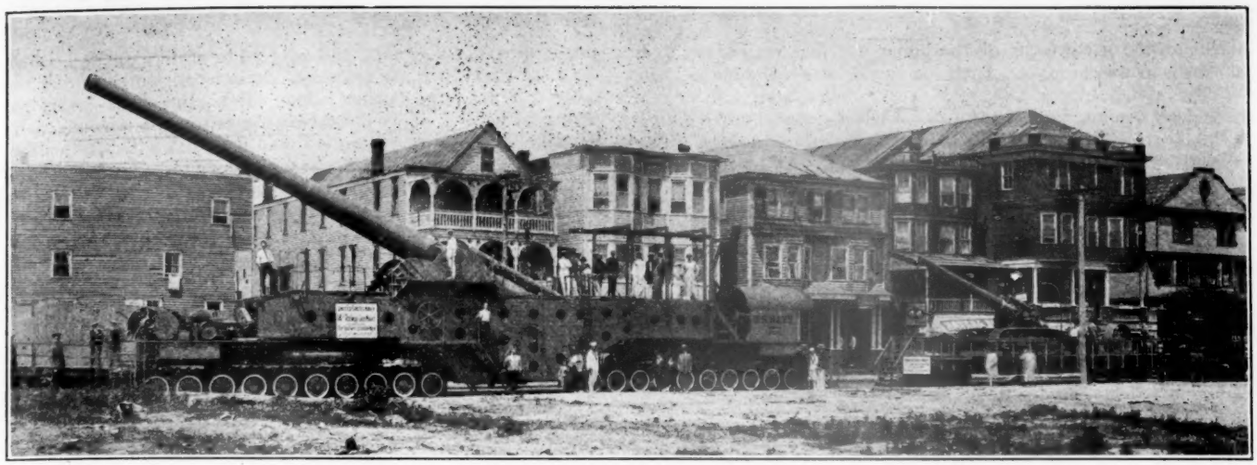
At 4.45 P. M. another train ran from Atlantic City in two sections and connected with the Manhattan Limited at North Philadelphia at 8 P. M. The Manhattan Limited also ran in two sections.

The 2.30 train for New York ran in three sections and the three sections contained 20 parlor cars and sleeping cars used as parlor cars. This was the first time that this train was ever run in more than two sections.

At 8.45 P . M. a train left Atlantic City containing through sleepers to Pittsburgh and this train was provided with enough cars to accommodate those desiring to use them.

Heretofore it was necessary to telephone to Philadelphia for sleeping car service. On this occasion, however, arrangements were made to provide extra cars for those leaving Atlantic City and space on them was bought direct from the consolidated city ticket office at Pacific and South Carolina avenues, in Atlantic City.

The Pennsylvania Railroad found it no easy matter to provide service for the convention visitors for two reasons. The first was that the attendance at the convention was unprecedentedly large. The second was that the railroads, owing to war conditions, are short of sleeping and parlor car equipment. Not only have the normal numbers of parlor and sleeping cars not been built in recent years but about 100 parlor cars have been converted into coaches for handling military business. However, the special arrangements which were made enabled the Pennsylvania Railroad to handle the convention crowds better than they had ever been handled before.



The Baldwin Locomotive Works Track Exhibit at the Convention.

American Railroad Association, Section III, Mechanical

Proceedings of the Closing Session of a Remarkably Successful Convention

The closing session of the first annual convention of the American Railroad Association, Section III—Mechanical, was called to order at 9.40 o'clock on Wednesday morning, June 25, 1919. .

Design, Maintenance and Operation of Electric Rolling Stock

C. H. Quereau
Chairman

THIS COMMITTEE SUBMITTED a report on the Heating of Passenger Trains Drawn by Electric Locomotives, an abstract of which is given below.

Under modern conditions and in states where there are laws which prohibit the use of fires in individual passenger cars, it is evident the successful electric operation of the through passenger trains over the usual steam railroad division, or for any distance approximating this, would be impracticable unless the locomotive can furnish sufficient steam to satisfactorily heat the train. A study of the problem was begun in 1902. This disclosed at once that there were almost no precedents to guide the investigators, either as to the design of the heating plant or the amount of steam required for heating purposes. The design of the present heating boilers has been, therefore, necessarily largely a matter of slow development. It seems appropriate that a brief sketch of the steps in this evolution should be given.

In the eleven years from 1902 to 1913 there were nine designs of boilers built and tested, four of them using electricity as the source of heat and five fuel oil. The electric boilers did not prove satisfactory for the reasons given in each case, while the oil-fired type was finally developed to a point where it has been quite generally adopted.

OIL-FIRED BOILER NO. 1, 1902

During the years 1902 and 1903 a flash boiler was designed having a nominal capacity of 1,000 lb. of steam per hour, using kerosene as a fuel, having 650 ft. of 2½-in. water tubes in series. Its development was discontinued because the accumulation of carbon on the tubes made the boiler inefficient, and trouble was experienced because of back drafts.

OIL-FIRED BOILER NO. 2, 1904

In 1904 and 1905 tests and experiments were made with a semi-flash type of boiler with a nominal capacity of 1,000 lb. of steam per hour. Vaporized kerosene was used as fuel to prevent the accumulation of soot, and a forced draft was applied to the stack to overcome the back draft. The steel water tubes were ½-in. extra strong seamless, and they were electrically welded to form two sections in multiple. Electrically driven pumps having ball valves were used, one for kerosene and another for water, each being controlled by a thermostat. This boiler design was abandoned because of the irregular action of the thermostats, the splitting of the tubes and the unreliability of the pumps.

ELECTRICALLY HEATED BOILERS

From 1906 to 1913 four designs of electrically heated boilers were built. In two of these the water was heated by passing through metal tubes carrying a current of electricity. The other two were essentially upright boilers with electric heating units inside the tubes. All four designs proved costly to maintain and were finally abandoned.

OIL-FIRED BOILER NO. 3, 1910

In 1910 the development of the oil-fired boiler was taken up again, with the result that finally this type has been perfected to a point where it is being used on most of the electric locomotives in the United States requiring steam heat. This oil-fired boiler consisted essentially of an upright boiler 22 in. in diameter, 16 in. high, having 856 copper tubes ½ in. in diameter, with 3/16-in. bridges in the tube sheets, a heating surface of 123.5 sq. ft., a working pressure of 80 lb. and a capacity of 400 lb. of steam per hour. This was not sufficient in cold weather to heat satisfactorily more than four-car suburban trains. As a number of these trains had seven and eight cars, it was imperative that the boiler capacity be increased at once.

The important changes made to increase the steam output to 800 lb. per hour were as follows: An automatic bonnet on the top of the stack, which decidedly improved the draft; increasing the steam supply to the burner, thus atomizing the oil more thoroughly and increasing the amount of oil burned; withdrawing the burner from the fire box till it projected just inside the door, resulting in a stronger inducted draft into the fire box, producing more perfect combustion.

During the early trails of the boiler the fact was noted that more steam was produced when the engine was standing still, or moving slowly, than when train speed was attained, smoke frequently coming from the fire box when the engine was making speed, particularly when passing under overhead bridges. The conclusion was reached that at speed and under bridges a horizontal air blanket over the stack prevented the free escape of the gases of combustion. This difficulty was overcome by the development of the automatic stack deflector, or bonnet, shown in Fig. 1. This device is operated by the air pressure developed by the movement of the engine, or may be thrown conveniently by hand. Its use increased the boiler capacity from 15 to 20 per cent by creating a partial vacuum at the top of the stack. The original form was open at the sides. Its efficiency was perceptibly decreased by strong side winds. The improved form remedies this defect.

Oil-fired Boiler No. 4, 1911

As soon as the fact was determined that the capacity of Oil-fired Boiler No. 3 could not be increased beyond 800 lb. of steam per hour, it became evident that it would not satisfactorily heat trains consisting of more than eight cars, and in 1911 plans were drawn and an experimental boiler of greater capacity built, differing from its predecessor only in size. This was 26½ in. in diameter, 30 in. high, having 1,180 copper flues ½ in. in diameter, a working pressure of 100 lb., 266 sq. ft. of heating surface and a steam capacity of 1,680 lb. of steam per hour. This boiler was used in a series of tests to determine not only the effect of increased heating surfaces, but the steam capacity necessary for through passenger trains.

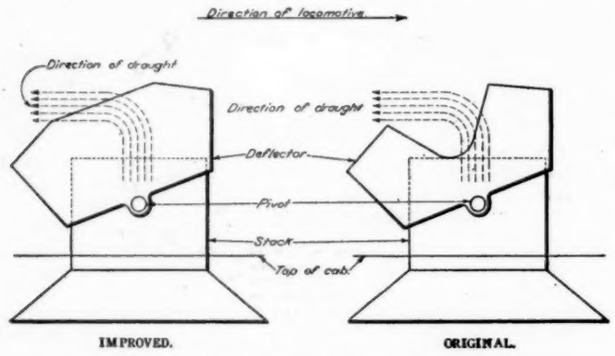


Fig. 1.—Stack Deflector or Bonnet

Oil-fired Boiler No. 5, 1912

As a result of these tests a still larger boiler was designed in 1912 and applied to twenty-nine electric locomotives. These boilers were 39 in. in diameter, had 1,380 copper flues 30 in. long and ½ in. in diameter, 436 sq. ft. of heating surface, a working pressure of 110 lb. and a capacity of 2,220 lb. of steam per hour.

Though based on the designs of Oil-fired Boilers Nos. 3 and 4, there were several radical changes, the most important being the use of a water leg 18 in. deep and 2½ in. wide; increasing the bridges between the tubes to 3/8 in.; the substitution of a forced draft in the fire box with a closed door for the natural draft used previously, and the use of two expansion joints of the bellows type in the boiler shell. A cross-section of this boiler is shown in Fig. 2 and a diagrammatic arrangement of the whole boiler plant, including the water and oil storage tanks and piping in Fig. 3.

Complete with oil and water storage tanks and piping, but without fuel oil or water, the heater equipment weighs 5,850 lb. and occupies a circular floor space somewhat less than five feet in diameter for the boiler and about the same for the storage tanks. Under service conditions these boilers evaporate something over 5 lb. of water per square foot of heating surface and something over 6 lb. of water per pound of oil, though in carefully conducted tests the evaporation per pound of oil has frequently been over 10 lb.

The fuel-oil burner used is shown in Fig. 4. This is very simple, very easily cleaned and adapted to eastern fuel oil, which has a paraffine base, or kerosene. It is worth noticing that the lower section of the burner, which carries the steam or air for atomizing the oil, projects beyond the oil orifice, forming a lip or shelf on which the excess oil may flow and still be atomized. Where it is more economical to use the heavy western oils having an asphalt base, it has been found necessary to leave off the lip, because of the liability of oil accumulating at that point and interfering with the steam jet, as shown by the experience of the Chicago, Milwaukee & St. Paul. Their burner is shown in Fig. 5. Only when the boiler is started is air from the main air reservoir turned into the stack blower to insure a draft and onto the burner to atomize the fuel oil. As soon as there is a steam pressure approximating 50 lb. a three-way cock is used to substitute steam for compressed air. With cold water in the boiler it requires only four minutes to develop a steam pressure of 10 lb. and ten minutes from starting the fire a steam pressure of 110 lb. is obtained.

Carefully checked recent tests have shown that the raising of the breeching, or smoke box, above the top flue sheet from its original height of 1½ in. to 10½ in. has resulted in increasing the steam capacity of these boilers 23.2 per cent. This is undoubtedly due to the fact that there is now a free exit for the gases from the outer tubes, which in effect increases the heating surface of the boiler, the products of combustion passing through these outer tubes having previously been choked by the limited area through which the gases from these flues could escape.

Particular attention is called to the fact that there is a superheater in connection with the boilers, as shown in Fig. 2.

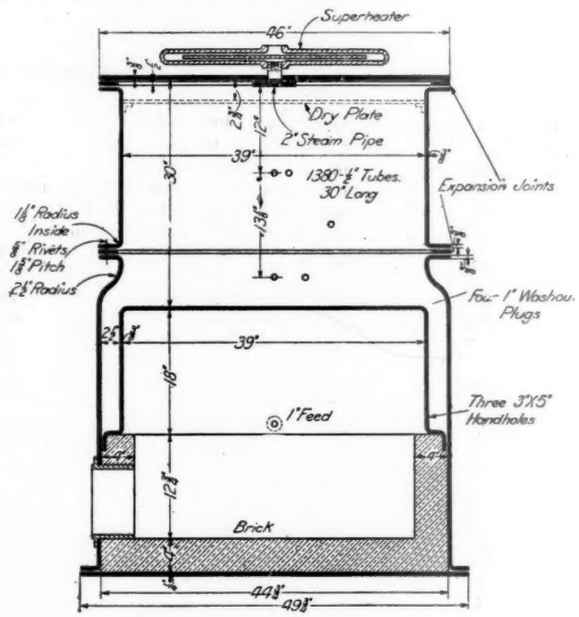


Fig. 2.—Cross-Section of Boiler

It is possible to obtain any reasonable degree of superheat required. Good practice indicates that about 15 degrees F. is desirable, as a high superheat damages the steam hose and gaskets. Tests show that when the steam is somewhat superheated it requires less steam per car per hour to satisfactorily heat it.

The type of boiler just described as Oil Fuel Boiler No. 5 is standard for the electric passenger locomotives on the New York Central, where their capacity is rated at 2,200 lb. of steam per hour; on the Chicago, Milwaukee & St. Paul, where it is rated as 2,600 lb. of steam per hour; on the New York, New Haven & Hartford, where the maximum capacity is given as 2,700 lb. and an average of 2,200 lb. per hour. It has been adopted for the electrified zone of the Canadian Northern Railway, where the heating plant is installed in a separate car, or trailer, instead of on the locomotive. Each of the railroads reports satisfactory results from these boilers. In each case the cars are heated from a steam header at terminals before the engines are attached or are delivered, properly heated, by the steam locomotives to the

electric engines. On the Chicago, Milwaukee & St. Paul the outside temperature is occasionally 40 degrees F. below zero, and their heating plant "appears to fully meet the requirements for the heating of the trains in the coldest weather." The New York, New Haven & Hartford reports that "in normal winter

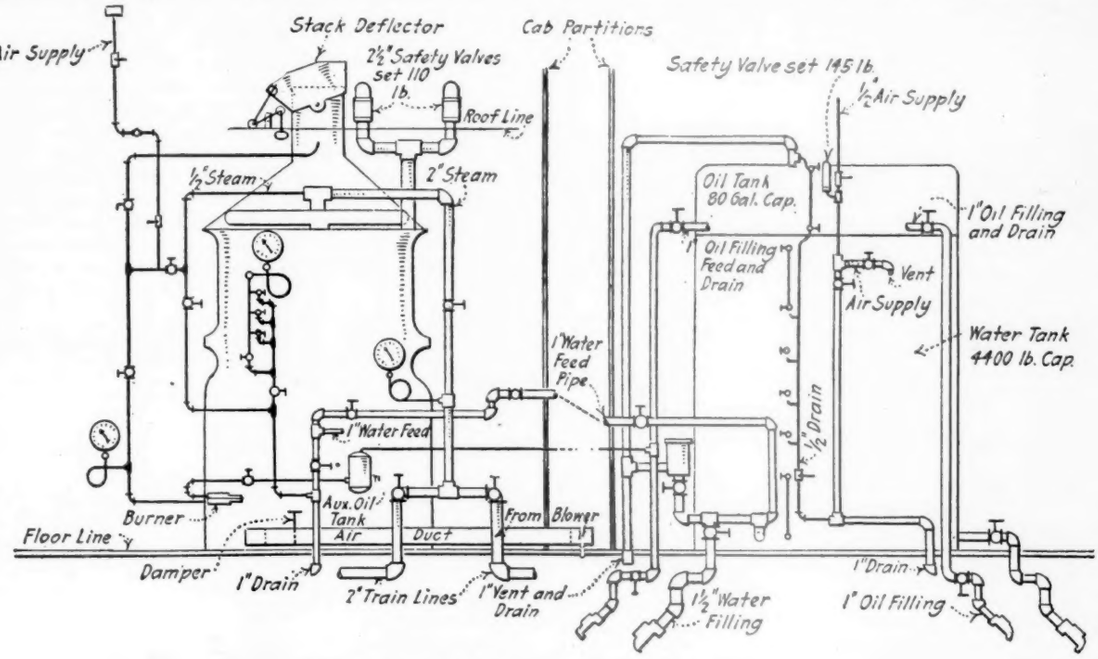


Fig. 3.—Assembly Diagram of Oil Fired Boiler

weather, with trains of nine cars or less, only one boiler is used, but with colder weather and longer trains we find it better to use two boilers, one from each locomotive."

It is evident that the heating plant should be designed to develop the amount of steam required by the most severe conditions, and that there are a number of conditions which influence the requirements. Among others are the following: The temperature of the outside air; the severity and direction of the prevailing winds; the number of cars in the train; the amount of radiating surface of the steam pipes; the cubical contents of the

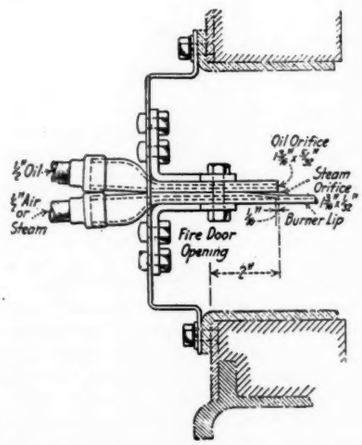


Fig. 4.—Burner for Paraffine Base Oils

cars; the ventilating system used in the cars; the presence or absence of double sash; the materials of which the cars are built, whether wood or steel, for instance; the efficiency of the heat insulation, especially in the case of steel cars, including, particularly, the steam line under and between the cars and the steam control on the cars, whether hand or automatic.

As far as the committee has been able to determine there are no data as to the amount of steam needed to satisfactorily heat passenger cars which can be generally applied. The results are usually given in pounds of steam per car per hour for various outside temperatures, without detailed information as to car dimensions, construction, ventilation or heating system. Under these circumstances the records are of no practical value except locally. These remarks apply to the following records:

A. & B. Ry.—Steel cars; running test:

Date.	Outside Temperature.	Lb. Steam Per Car Per Hour.	
January 8, 1910.....	22 Degrees F.	161	
February 7, 1910.....	5 Degrees F.	257	
February 7, 1910.....	6 Degrees F.	267	
February 7, 1910.....	6 Degrees F.	291	
February 7, 1910.....	18 Degrees F.	203	
February 7, 1910.....	18.5 Degrees F.	55.2	{ train line only.

C. & D. Ry.—Wooden, 53-ft. suburban cars, single sash; running test:

Date.	Outside Temperature.	Lb. Steam Per Car Per Hour.	
January, 1912	41 Degrees F.	95	
January, 1912	35 Degrees F.	114	
January, 1912	37 Degrees F.	90	
January, 1912	32 Degrees F.	85	
January, 1912	36 Degrees F.	90	
January, 1912	25 Degrees F.	122	
January, 1912	23 Degrees F.	133	
January, 1912	23 Degrees F.	129	
February, 1913	28 Degrees F.	147	{ steel coaches double sash.

E. & F. Ry.—Yard tests. British thermal units per car per hour per degree Fahrenheit; difference between temperatures inside and outside car:

January, 1916..Pullman car, indirect steam heat..... 980 B. t. u.
January, 1916..Steel coach, direct steam, automatic control...1,450 B. t. u.
January, 1916..Wooden coach, direct steam, hand control.....1,530 B. t. u.
January, 1916..Wooden coach, direct steam, automatic control. 890 B. t. u.

"With outside temperatures between 20 and 32 degrees F. each car takes about 200 lb. of steam per hour, and with an outside temperature of 0 degrees F. the consumption of steam per car per hour approximates 225 to 250 lb."

So far as the committee is informed, no practical steam boiler has yet been developed which uses electricity as a source of heat. Assuming that such a heating plant is available, there are certain facts which should be borne in mind. The cost of electricity to produce a given amount of steam is from six to ten times that of fuel oil, omitting the item of fixed charges in the cost of current. The radio depends on the relative cost of fuels. If the peak load for propulsion and heating current come at the same time, during the Christmas holidays, for in-

stance, it will be necessary to increase the power station and substation capacity, not only increasing the capital invested, but incurring additional fixed charges, which continue during the whole year, though the additional apparatus is required for only a few months during the heating season. Estimates made a few years ago showed that electrically generated steam would cost about $45,000 a year more than from oil-fired boilers, the number of locomotives involved being less than 35, not including fixed

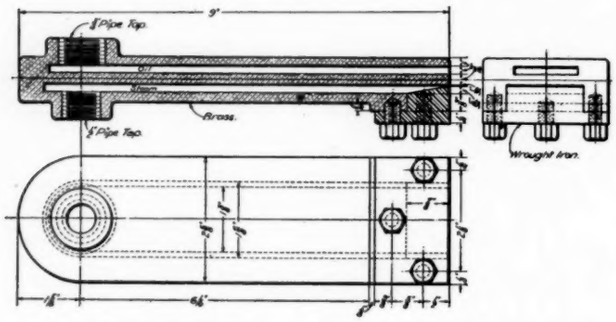


Fig. 5.—Burner for Asphalt Base Oils

charges in the cost of current. If fixed charges are included, there would be in this case a saving of over $100,000 a season in favor of oil as a source of heat.

There is undoubtedly an element of danger of fire in the use of fuel oil or kerosene. This was greater in the earlier designs of heating plants, when the oil was under air pressure, than with later designs, which feed the oil by gravity. Care in design, construction and operation has shown the hazard is small.

The experience with the electric steam boilers has been so very limited there are practically no facts on which to base an opinion as to the liability of fire and personal injury in their use. That there is an element of danger there can be no doubt. There are, however, certain conditions, such as long tunnels,

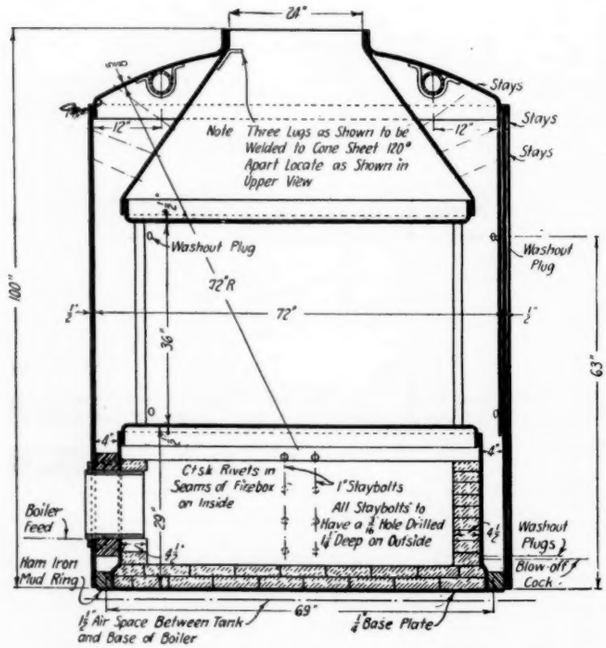


Fig. 6.—Vertical Fire Tube Boiler Used on C., M. & St P.

which make the electrically heated steam boiler very desirable and in all probability will result in a successful design.

The report is signed by C. H. Quereau (Chairman), New York Central; G. C. Bishop, Long Island; J. H. Davis, Baltimore & Ohio; Geo. McCormick, Southern Pacific; H. R. Warnock, Chicago, Milwaukee & St. Paul; W. L. Bean, New York, New Haven & Hartford; J. T. Wallis, Pennsylvania; J. E. Pilcher, Norfolk & Western, and A. C. Deverell, Great Northern.

In addition to the report of the committee, H. R. Warnock submitted an exhibit containing a description of the latest type of heating boiler used on the Chicago, Milwaukee & St. Paul.

Exhibit A

Oil-fired Boiler, 1918, Chicago, Milwaukee & St. Paul

In Circular No. N-1916-1917 of the American Railway Master Mechanics' Association is described this road's present practice under the heading "Oil Fired Boiler No. 5—1912," which covers a vertical fire tube boiler containing 1,380 ½-in. flues 30 in. long. These boilers had copper flues and the total heating surface is stated to be 436 sq. ft. with a rated capacity of 2,600 lb. of steam per hour. Approximately two years ago, when it was decided to build fifteen new road passenger locomotives, one of the things

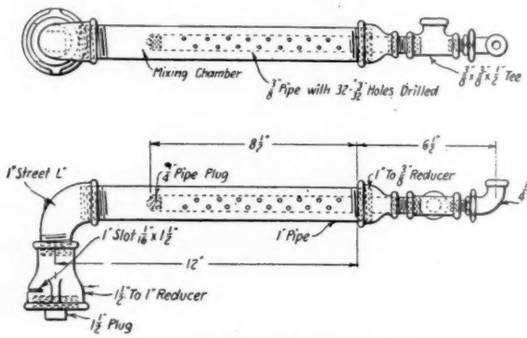


Fig. 7.—Details of Oil Burner

undertaken as an improvement was a new design of the heating-boiler. The undesirable features of our present boiler were maintenance costs and insufficient capacity. We have had much trouble in heating our through trains (which consist of ten cars, frequently), when the outside temperature gets much below zero.

After some preliminary tests or observations, it was decided that we needed a boiler of nearly twice the capacity of those in use at present. To this end was designed a vertical fire-tube boiler, as shown in Fig. 6. This boiler is 72 in. inside diameter, is of the submerged flue type, and contains 468 1½-in. flues 36 in. long. With this boiler we have a total heating surface of 624 sq. ft., a grate area of 21.8, which gives a ratio of heating surface of grate area of 28.6. This design of boiler has a light weight of approximately 10,500 lb., and with two gages of water, the weight becomes about 15,500 lb.

An experimental boiler was built in the summer of 1918, and mounted for testing. We were trying for a boiler that would produce 4,000 lb. of steam per hour, and, it being impossible to get this much with natural draft, we resorted to forced draft. The fire box is lined throughout with brick, excepting the flue-sheet. Air was forced through the door by a motor-driven blower. Quite a number of tests were run throughout a period of several months, the main object being to determine the maximum capacity, as well as the proper drafting arrangement. Two burners were used, made up as shown in Fig. 7, with a slot sawed in each to give a range of about one-half the fire box in each case. It is noted that this burner consists of ordinary pipe fittings, and is an adaptation of what is in use on the Southern Pacific. We have tried several other types of burners, but find this one to be the most satisfactory for our purpose. These burners are set to project 12½ in. from the inside of fire door. This just clears the inside of the fire-door frame.

Following are some data giving the maximum results we were able to obtain:

Test Data.	
Temperature of atmosphere, degrees F.	85
Temperature feed water, degrees F.	70
Average boiler pressure, lb. gage	106
Oil consumed per hour, lb.	403
Water evaporated per hour, actual, lb.	4,022
Pounds water per lb. oil	9.97
Equivalent Evaporation from and at 212 Degrees F.	
Water evaporated per hour	4,780
Pounds water per lb. oil	11.85
Horse-power developed	138

In getting these results, we find that it is desirable to have the oil pressure and the steam atomizing pressure about 40 lb. each. It is necessary that the steam atomizing pressure does not exceed the oil pressure, else the steam backs up in the oil line, causing saponfication, and consequently interrupting the flame. These boilers are intended to be operated at a working pressure of 110 lb. gage, and the fuel is atomized by an air jet when beginning the fire, but on reaching a pressure of about 40 lb., the turning of a three-way cock cuts out the air and introduces steam as an atomizing agent.

The amount of air delivered for the above maximum capacity was found to be 2,650 cu. ft. per minute against a static pressure of 2 in. of water at the blower outlet. It is expected that our normal requirements will rarely ever exceed 1,800 cu. ft. of air per minute against a static pressure of possibly 1¼ in. of water.

This test being conducted in the open air and with a fairly still atmosphere, we had no trouble in regulating the proper amount of air to produce a smokeless combustion. During the test the auxiliaries were driven by steam from the boiler. These auxiliaries will consist of the feed-water pump, oil pump and atomizers. The calculated consumption of these auxiliaries, when driving the boiler at maximum capacity, is 800 lb. per hour, which would leave a net amount of 3,200 lb. actual for train line. This amount is thought to be more than sufficient for weather 40 degrees below zero if all connections are tight. An assembly diagram is shown in Fig. 8. Generally speaking, we believe we have ample capacity without too careful firing.

Discussion

W. J. Bohan (N. P.): I would like to ask Mr. Warnock what it costs him to develop the boiler horsepower of that boiler, what he figures it will cost and about what your average heating per train mile is per annum?

Mr. Warnock: I don't think we have that data at hand. We probably have it in our report some place, but I don't have it with me.

A motion to receive the report and incorporate it in the proceedings was carried.

Use of Bronze for Valve Snap Rings and Piston Surfaces, and Bull Rings in Large Cylinders

By C. E. Fuller
Superintendent Motive Power, Union Pacific

UNDOUBTEDLY ONE of the most difficult and perplexing problems relating to locomotive operation is the proper and economical maintenance of pistons and cylinder walls, valves and bushings—those parts which, by their proper relation of sizes, and constantly varying relative positions, govern the correct and economical use of the steam which the boiler has generated. In this region may all too frequently be located the greatest wastes on the entire locomotive.

Since the introduction of modern outside valve gears has eliminated much of the old-time faulty and lame valve setting, the losses within the cylinder have easily taken first place. At no other point on the locomotive can the losses become so great, or so quickly aggravated, due to rapid cutting and wear; nor has the introduction of superheated steam, with increasing size of cylinders, tended to ameliorate conditions. Cylinder working temperatures, which have so direct a bearing on the rate of wear, have increased tremendously in the last ten years.

The extensive operation of cylinder bushings on modern power indicates the enormous increase in cylinder barrel wear and a desire to save cylinders, which otherwise would soon wear thin. Extended piston rods to carry the weight of the pistons in large cylinders are a compromise, and there appears a trend toward their abandonment. A decrease in the unit pressure between the piston and the cylinder walls can only be attained at the expense of increased reciprocating weight and dynamic augment. Cylinder and valve lubrication under increased superheat temperatures is surrounded by many difficulties. With these facts in mind, the mechanical department of the Union Pacific began experiments in 1913 with bronze valve snap rings, and in 1915 with bronze surfaces for pistons. No originality is claimed in this connection, as perhaps many of those present have experimented more or less along similar lines, but the results obtained are worthy of some consideration.

Bronze Valve Snap Rings

Two formulas have been used:

Composition A:		Composition B:	
Copper	82.96 per cent	Copper	80.80 per cent
Tin	14.66 per cent	Tin	5.83 per cent
Phosphor	.118 per cent	Phosphor	.10 per cent
Lead	none	Zinc	4.54 per cent
Impurities	2.26 per cent	Lead	6.58 per cent
		Impurities	2.15 per cent
Total	100 per cent	Total	100 per cent

Either composition gave good wearing qualities, but composition *A* has decided advantages in elasticity. We believe, however, that there is room for further improvement in the composition of the most suitable alloy for this purpose.

Valve rings are of the usual L-section for 15-in. piston valves of cast iron, working in gun-iron bushings. Information collected in 1915, or previous to the recent rise in wage rates and material, relative to comparative mileage and cost of cast-iron and bronze valve rings may be of interest, showing that against 117 cast-iron rings, making 216,495 engine miles, there were 45 bronze rings, making 381,337 engine miles—an increase in mileage in favor of the bronze ring of 358 per cent.

The average cost per one thousand engine miles was:

Bronze ring	8.73 cents
Cast-iron ring	20.0 cents

or an increase of 129 per cent for the cast-iron ring. This test covered a period of thirteen and one-half months, during which no valve gages were removed where bronze rings were used.

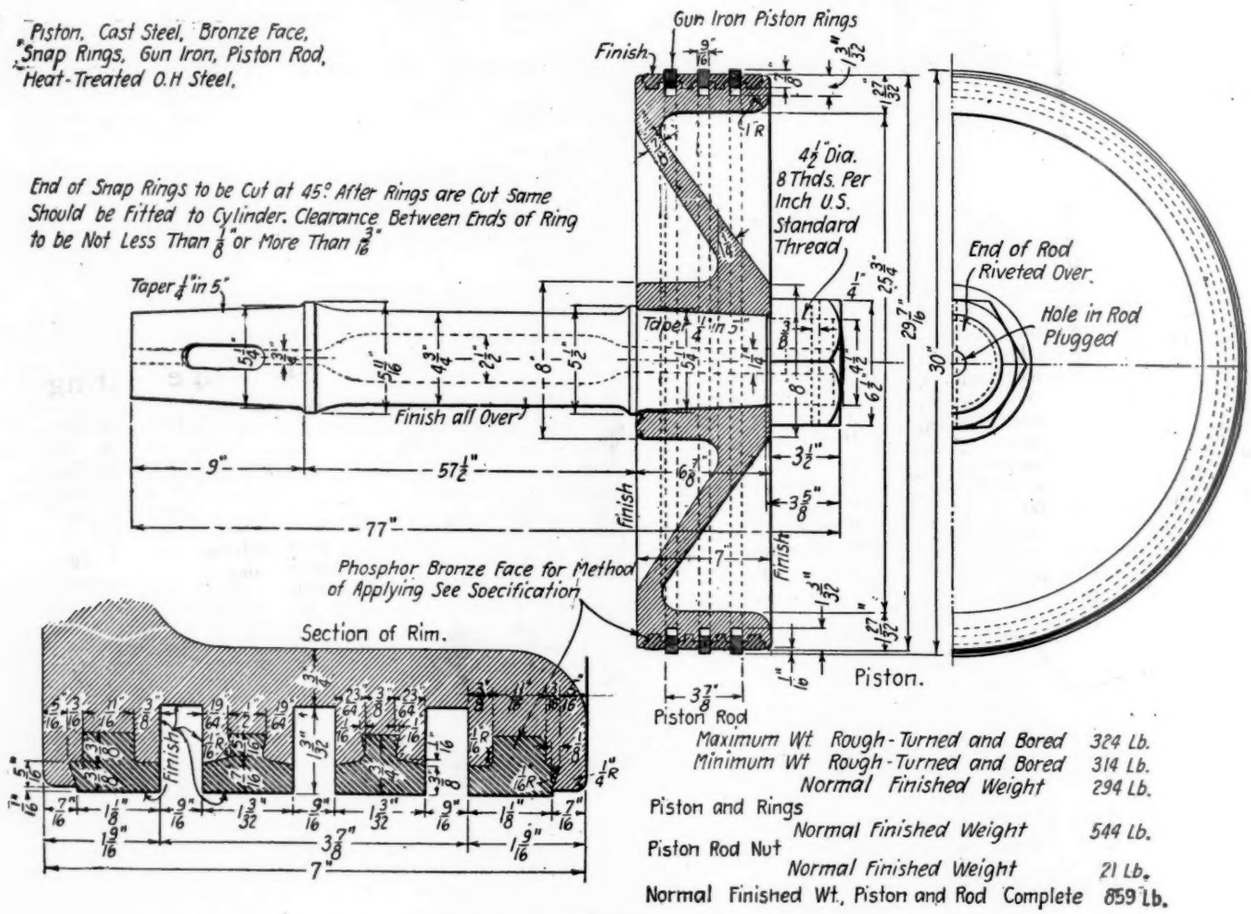
A Pacific type engine was equipped with bronze rings—composition "A," April 13, 1916: The rings were removed, worn out, on March 22, 1918, with a mileage of 145,285.

Piston Surfaces

In August, 1915, a Consolidation type engine with 22-in. cylinders was equipped with two cast-iron pistons having a bronze bull ring poured on while the pistons were at about 1,500 degrees F.—afterwards machined to size, including ring grooves which were fitted with gun-metal rings. This test was in contemplation of the use of bronze for surfacing 29½-in. diameter cast-steel Z-type pistons, designed for use on a proposed 2-10-2 type locomotive, which was then under consideration for the 60-ft. grades between Ogden and Evanston. If possible, it was desired to escape the necessity for using an extended rod on a large diameter cylinder. It was known that at least a year would intervene before a decision was necessary.

Frequent reports from this engine indicated that these pistons were performing quite satisfactorily, the rate of wear on pistons and cylinder walls being much below the average with cast-iron pistons. The bronze adhered to the piston head without fracture. In June, 1916, this engine was shopped, both pistons being reapplied without any work being done on them, mileage, 40,000. In March, 1918, this engine had a cracked cylinder necessitating shopping. The pistons, still in fair shape, were reapplied to another engine, after having made 120,000 miles, and up to December 31st last had made an additional 19,000 miles, and, to the best of my knowledge, are still in service. The success of this experiment led us to adopt the bronze face without hesitation for the new design 29½-in. pistons for the 2-10-2 type engines, and drawings were accordingly prepared. Upon being forwarded to the builders we received an immediate complaint that the design was impracticable from a manufacturing standpoint, as it was considered impossible to pour a bronze ring on a cast-steel head, on account of the different shrinkage coefficients. To this we replied by getting four steel castings from the same pattern, successfully pouring and machining them—sending photographs of the finished pistons to the builder as evidence, then putting the pistons in stock for the anticipated locomotives.

The builders had no difficulty in following the design, and ten engines arrived, equipped with the bronze-faced cast-steel pistons, in the fall of 1917, and were placed in hard mountain service, where drifting is necessary for sixty miles, with little let-up. After being in service six months the bronze had worn down to the cast-steel lip at the edges of the piston, between 1/32-in. and 1/16-in. Pistons were then reversed, and gave four or five months' additional service. Since then, from time to time, this cast-steel lip has been turned back slightly, exposing additional bronze surface, and at the end of nineteen months, several of these pistons are still in service, not having reached the limit of wear with their original bronze surface. The piston centers, however, are all intact and apparently capable of indefinite service. These pistons have made over 60,000 miles in most difficult service, and no cylinders have been rebored; in fact, showing remarkably little wear. Incidentally, the use of bronze permitted the adoption of a very light design of piston, which, though 29½-in. diameter, weighs only 544 lb. complete, without the piston rod.


Piston, Cast Steel, Bronze Face, Snap Rings, Gun Iron, Piston Rod, Heat-Treated O.H Steel.
Gun Iron Piston Rings
Finish
End of Snap Rings to be Cut at 45°. After Rings are Cut Same Should be Fitted to Cylinder. Clearance Between Ends of Ring to be Not Less Than 1/8" or More Than 3/16"
4½" Dia. 8 Thds. Per Inch U.S. Standard Thread
End of Rod Riveted Over
Hole in Rod Plugged
Taper 1/4" in 5"
Finish all Over
9"
57½"
77"
Phosphor Bronze Face for Method of Applying See Specification
Section of Rim.
Piston.
Piston Rod
Maximum Wt Rough-Turned and Bored 324 Lb.
Minimum Wt Rough-Turned and Bored 314 Lb.
Normal Finished Weight 294 Lb.
Piston and Rings
Normal Finished Weight 544 Lb.
Piston Rod Nut
Normal Finished Weight 21 Lb.
Normal Finished Wt., Piston and Rod Complete 859 Lb.

29½-inch Cast Steel Piston with Bronze Face

The drawing indicates the detail application of the bronze in dovetail grooves for the purpose of preventing individual sections from leaving their place in case they become detached from the main mass of bronze.

The composition of the bronze on these pistons is as follows:

Copper	86 to 89 per cent
Phosphor—Tin	4 to 6 per cent
Tin	4 to 6 per cent

Oxwelding Bronze Surfaces on Cast-Iron Piston Heads

This practice is of more recent origin, having been in vogue about six months. It is purely a reclamation process, but indications to date are very favorable. Cast-iron piston heads, which, heretofore, have been scrapped on account of wear—which usually takes place mainly on the bottom half of the head—are now treated as follows: The pistons are preheated in a brick furnace over a charcoal fire to a temperature of 900 to 1,000 degrees F., without removing the rod. A small hole is then made through the sheet asbestos on top of the furnace over the piston, to permit the welding operator to work—the piston being turned from time to time by means of the rod as the work progresses. A thin layer of bronze is first welded over the worn surfaces between and adjacent to the ring grooves for approximately one-half of the circumference of the head, then built up to the desired height, including finish, after which the furnace is closed and the fire is allowed to die out and cool over night. The piston is then machined, the grooves squared up, and is ready for service, being applied with the bronze shoe to the bottom of the cylinder. Tobin bronze welding rods are used—about 8 lb. average, per 26-in. piston.

It is contemplated from our previous experience with the fully bronzed circumference, and particularly in view of the fact that most of the wear is at the bottom of the cylinder, that these reclaimed pistons will not only show a considerable increased mileage, but will also show a material saving in cylinder-barrel wear, thus increasing the mileage between reborings.

A 26-in. worn cast-iron piston can be treated in accordance with the above process for approximately $9.35, while replacements with a new piston of the same design would cost $27.86. This results in a saving of $18.51—besides resulting in really a better piston than the original on account of decreasing the tendency toward wearing the barrel of the cylinder. Up to date about 50 pistons have been thus reclaimed and put into service, and there has not been a single failure reported.

By the use of bronze for valve snap rings and for piston surfaces, we have been able to materially reduce the rate of

wear and increase the life of the cylinder and valve bushings, as well as the pistons, and keep locomotives longer in service with a maximum of power due to tight and properly fitting parts.

Discussion.

J. Chidly (N. Y. C.): I ask Mr. Fuller how many engines he has equipped with the snap ring packing in the valves. I see that he has had the installation since 1913.

Mr. Fuller: I should say there are pretty close to 200 engines equipped, and they are mostly heavy Pacifics and Mikados.

Mr. Chidley: Do you intend putting the bronze rings in the cylinder packing?

Mr. Fuller: We have thought of it. I believe we tried it, but we have not been able to get a ring deep enough.. A bronze ring in the cylinder will have to be pretty nearly 1⅛ in. or 1¼ in. deep.

Mr. Chidley. You figure on snap rings?

Mr. Fuller: Yes, but we find it pretty hard to get over the solid head. In the case of a built up head you will have no trouble, but you will have to make your rings much deeper with any kind of cast iron.

B. P. Flory (N. Y., O. & W.): I would like to ask if in the tests of the valve snap rings the cast iron rings were the ordinary cast iron or whether they were gun iron.

Mr. Fuller: They were ordinary cast iron at first, but later on were of gun iron.

Mr. Bentley: The use of bronze rings for piston heads is not new. About thirty or forty years ago we used them, and found them rather satisfactory on cylinders that were very soft. They wore very much longer than the ordinary mild steel rings that we used in the rest of the cylinders. One thing that impresses me very much is the reclamation of worn parts by the Oxweld process. We are not having any particular difficulty. We have been using common cast iron recently and the reports from the master mechanics indicate that we are getting very good results, but we are still having some trouble with cylinder packing rings, although we have increased our average mileage from 12,000 miles per set of rings to over 41,000 miles. There is an opportunity for the reclamation of material that is now finding its way into the scrap, and I think with the one-piece piston head that is shown in the diagram here the building up of that piston head after it becomes worn will be of very great assistance to us in keeping the locomotive in service.

R. J. Mead: I would like to know if any of the members are using a built-up type of piston in the super-heated engine. We have used them, and came to grief, and I would like to know if you are having any success?

Mr. Bentley: That is our standard practice. We have about one thousand engines using superheated steam, that have built-up pistons.

Mr. Bohan: I would like to ask the gentlemes if they have tried reclamation with cast iron instead of bronze?

Mr. Fuller: Yes, we have tried it. We had difficulty in welding cast iron and keeping it sufficiently soft to do the work. I have no doubt, from the results that we are obtaining, in welding cylinders with cast iron, and in which we are getting a metal that is practically of the same consistency as the original casting, that a good operator will be able to weld cast iron to cast iron piston heads successfully, but we have not been able to do it yet. We had trouble to get the bronze to adhere and not have it too hard and break off.

I want to call attention to the depth of grooves in our piston heads. The grooves are 1 3/32 deep, and the packing rings are ⅞ in. deep. We found that a large percentage of our trouble is due to too many applications of packing; that the packing could not get below the grooves, or, in other words, the piston was riding on the packing. One of the important things in any piston is to have plenty of clearance, and I would not oppose going to a still deeper groove.

Mr. Bohan: The matter of depth of grooves on piston heads is one that has to be very carefully considered on account of the possibility of getting them so deep that the corners will break out on this particular grooved cast iron head.

Chairman: The depth of grooves in the piston heads should have sufficient limits to take care of the new ring applied in the head just before it reaches its full wear limit.

A motion to receive the report and incorporate it in the proceedings was carried.

Committee on Train Resistance and Tonnage Rating

O. P. Reese
Chairman

THE COMMITTEE REPORTED that on account of the conditions existing during the last year there have been no new developments with reference to train resistance and tonnage rating upon which the committee could take action.

The committee consists of O. P. Reese (Chairman), Pennsylvania Lines; H. C. Manchester, Delaware, Lackawanna & Western; C. E. Chambers, United States Railroad Administration; J. H. Manning, Delaware & Hudson; Frank Zeleny, Chicago, Burlington & Quincy; Major E. C. Schmidt, University of Illinois, and Jos. Chidley, New York Central.

Report of the Committee on Subjects

THE COMMITTEE SUBMITS the following suggestions for the consideration of the General Committee in preparing the program for the 1920 Convention:

I—That the present standing and special committees be continued.

II—That the following subjects be assigned to committees as recommended.

1.—Investigation of the proper number of crossties to be used on hopper coal cars. It is recommended that this subject be referred to the Committee on Car Construction.

2.—The proper fibre stress to be employed in the design of helical springs for different diameters of steel wire from ½ in. to 1½ in. diameter. The ordinary spring table calls for 80,000 lb. throughout for all sizes, but it is well known that this is not the manufacturers' practice, and in fact in many cases it is impossible to obtain a proper spring with the smaller sizes of wire. It is recommended that this subject be referred to the Committee on Tests and Specifications for materials.

3.—That consideration be given to adopting the standard half tape sizes for cast iron and rough rolled steel wheels.

4.—That in the manufacture of steel wheels the wheels be machined to exact diameters. It is recommended that these two subjects be referred to the Committee on Car Wheels.

5—Repairs to superheater units. It is recommended that this subject be referred to the Committee on Superheater Locomotives.

6.—The desirability of more water and steam space above the crown sheet. It is recommended that this subject be referred to the Committee on Design and Maintenance of Locomotive Boilers.

7.—Equated tonnage ratings. It is recommended that this subject be referred to the Committee on Train Resistance and Tonnage Rating.

8.—Auxiliary or safety connection between engine and tender. It is recommended that this subject be referred to the Committee on Standards.

9.—Design for coal space of locomotive tenders to allow the coal to flow within easy reach of the fireman, and to permit it to practically all feed into the hoppers of locomotive stokers. It is recommended that this subject be referred to the Committee on Mechanical Stokers.

10.—Specifications for tank hose. It is recommended that this subject be referred to the Committee on Specifications.

11.—Water glass fittings and mountings. It is recommended that this subject be referred to the Committee on Design and Maintenance of Locomotive Boilers.

12.—Standard practice for beading tools for boiler tubes or flues. It is recommended that this subject be referred to the Committee on Design and Maintenance of Locomotive Boilers.

13.—Proper location of blow-off cocks in locomotive boilers. It is recommended that his subject be referred to the Committee on Design and Maintenance of Locomotive Boilers.

III—That the following subjects be assigned to special committees:

1.—Feed water heaters for locomotives.

2.—Modernization of stationary boiler plants.

3.—The comparative merits of hydrostatic and force feed lubrication for locomotive cylinders and steam chests and best method of application.

4.—Front end netting and netting door and other draft appliances.

5.—The study of ash pit and coal chute operation including organization and supervision. Roundhouse operations as a whole.

6.—Modernization of existing old locomotives.

7.—Automatic hose connectors for freight and passenger equipment.

8.—Standard method of packing journal boxes on freight cars.

IV—That the following subject be assigned to a member as a subject for an individual paper.

A study of locomotive operation from the point of view of a large investment.

The report is signed by M. K. Barnum (Chairman), Baltimore & Ohio; C. E. Fuller, Union Pacific; D. R. MacBain, New York Central; T. H. Goodnow, Chicago & Northwestern, and J. C. Fritts, Lackawanna & Western.

Discussion

M. K. Barnum (B. & O.): You will have the printed report of the committee in your hands, and I will read only the additional subjects which have been suggested since this report was printed.

Additional subjects presented are: Electric Arc Welding in Railroad Repair Shops; Scheduling and Routing Systems for Locomotive Repair Shops; Combustion Chambers for Locomotive Boilers; Results as to Fuel Economy; Difficulties in Maintenance, and other points of interest; Economical Diameters of Piston Valves of Superheated Locomotives, with Recommendations for Standard Practice in connection with Various Cylinder Diameters.

The committee recommends that these subjects be referred to a special committee.

The next subject is Modernizing Freight Equipment.

The committee recommends that this be referred to the Committee on Car Construction .

The next subject is: "What Shape of Exhaust Nozzle Will Cause the Highest Vacuum and Least Back Pressure in Cylinders?"

The committee recommends that this subject be referred to a special committee in connection with "Front End Netting and Netting Door and other Draft Appliances" that was mentioned in the printed report.

Because of the suggestions made by your chairman in his opening address, the committee also wishes to recommend the following subjects:

"Designs with Complete Lay-Outs for Roundhouses of Various

The committee suggests that this could be treated in connection with subject No. 5, "Study of Ash Pit and Coal Chute Operation, Including Organization and Supervision. Roundhouse Operations as a whole."

If that suggestion does not meet with the approval of the chairman it will be subject to his revision as a member of the General Committee which will pass on all of these subjects.

Repair Shop Lay-Outs for both Passenger and Freight Car Repair Shops: also Lay-Outs for Freight Car Repair Tracks, including a study of results obtained and advantages gained by inclosing the Repair Tracks under roof.

The committee recommends that this subject be treated by a special committee.

Power Plants for both Roundhouse Terminals and Repair Shops and suitable Stokers for such Power Plants.

The committee suggests that this be treated in subject No. 2, "Modernization of Stationary Boiler Plants."

Ash Pit Lay-Outs for both Dry and Water Pits.

The committee suggests that this be treated in connection with subject No. 5, together with the lay-out for round houses and a study of the Ash Pit and Coal Chute operations.

Adequate Lighting of Engine Terminals for Night Work.

It is suggested that this be handled by a special committee.

Mr. Goodnow: I would move that the report be received and referred to the General Committee for such modifications as they may find desirable or necessary to adapt it to the programme arranged for the next convention.

C. F. Giles: I expect that the motion made by Mr. Goodnow would be the proper course to pursue is handling this report, but I would like to call attention to the fact that sometime ago it was stated that we would probably endeavor to handle the work at the next convention within one week instead of extending it over two weeks, and therefore the subjects to be handled next year should be given most careful consideration, and we should reduce them to the lowest possible number, is my opinion.

Mr. Barnum: I think there is a question as to whether the subjects that have been presented could be handled satisfactorily within one week. In checking over the list, I find there will be about forty-five committees, even with the combinations that have been suggested, and that is one reason why it seems advisable to pass the matter up to the General Committee for such modification as they may deem necessary when they are deciding upon the final programme for next year's convention. It is believed by the Committee on Subjects that all of these subjects suggested are important and should be considered.

Chairman: I believe that it is opportune at this time for the chair to say a word, inasmuch as the question of how the convention will be held next year has been brought up; whether it will be held within one week or spread over two weeks, as has been our practice for years.

I think all of the members appreciate the brief time that we have had at our disposal at this convention to inspect the exhibits; in fact, it was suggested by some of the members that we hold the convention, that is the exhibits, over until to-morrow evening, to give every one an opportunity to see them. That was not practicable this year, as many of the exhibitors have made their plans for leaving to-day. I am, however, very much impressed with the idea, and it is my intention to suggest something of that kind for consideration at the first meeting of the General Committee. I had the assurance that the question of how the convention would be held next year would be left entirely to the decision of the General Committee, and I want to say, for the information of the members, that as chairman of that General Committee it is my intention to make no change in our method of holding these conventions and I hope we get the entire support of the General Committee in that position. It would be most unfair, gentlemen, to all of these exhibitors who have gone to the expense and trouble to put on this vast display for the information and education of the railroad men of this country, to limit the time of this convention to such a short period that everyone would not have the opportunity of seeing what is on the pier and learning all that can possibly be learned, which is a very considerable amount.

Mr. Goodnow's motion was then put to vote and carried.

Report of the Committee on Powdered Fuel

C. H. Hogan
Chairman

AT THE TIME OF THE LAST REPORT of the committee in 1916 there were several experimental installations for burning powdered fuel on locomotives in the United States, but the increasing demands for transportation, due to the great war, and finally the entrance of this country into the conflict, made the setting aside of even a single locomotive for such experimental purposes an impossibility. Accordingly all locomotives that had been equipped for the burning of powdered fuel were stripped of the special appliances intended for that purpose and returned to their regular service. For this reason the committee asks to be relieved from making even a report of progress at this time.

The general principles involved in the burning of powdered fuel were set forth in our last report when the experiments were progressing so satisfactorily that they seemed about to spell success. That the principles were correct has been demonstrated and it remained to work out the practical details to meet the varying requirements that locomotive service demanded, as has been done for stationary plants. But this sudden stoppage of the work, immediately after the presentation of our last report, leaves matters almost exactly as they were at that time.

It is probable that, as soon as the affairs of the railroads are settled and normal conditions have beeen resumed, the experiments with and development of the devices for burning powdered fuel will be taken up again. With conditions as they are, the committee is asking to be relieved from the necessity of making a report at this time and to be continued pending the resumption of the experimental work which they were appointed to watch and lay before the association.

The report is signed by C. H. Hogan (Chairman), New York Central; E. W. Pratt, Chicago & North Western; Thomas Roope, Chicago, Burlington & Quincy; J. H. Manning, Delaware & Hudson; Charles James, Erie; G. L. Fowler and O. S. Beyer, University of Illinois.

Discussion

W. D. Woods (Fuller Engineering Co.): In the report of the committee there was no mention of the possibilities which might be obtainable in switching service from pulverized coal. I want to mention that there has been a switching locomotive in continuous service for some 18 months successfully using pulverized coal. It is at Fullerton, Pa, and there has been no difficulty with the locomotive at any time. The only cost of maintenance has been for one brick arch. Economies of about 40 per cent of the coal as fired over what was obtained with hand firing have been secured. There is a Lehigh Valley locomotive equipped with practically the same aparatus on exhibition here.

S. S. Riegel (D., L. & W.): I would like to ask the members if they have had any information concerning experiments on the colloidal mixture of powdered fuel and crude oil. I understand that for nearly a year experiments of that nature have been conducted with a mixture of powdered fuel and crude oil of any desired richness which justify the hope of success, and I would like to put the matter before the association for the uprpose of finding out any information that might have been derived. It seems to me that if this plan of using powdered fuel can be worked out, there is a great field for its application in industrial plants, furnaces and perhaps locomotives.

C. H. Hogan (N. Y. C.): I think it would be a difficult matter to feed a mixture of powdered fuel and oil. Possibly if there are any locomotives so equipped in this country those in charge can explain.

Mr. Wood: I happened to be present at some tests in April, May and June, 1918, of colloidal oil on the U. S. S. Gem, where colloidal oil in combination with 30 per cent. of pulverized coal mixed with 60 per cent of ordinary navy fuel oil was burned in the regulation oil burners very successfully. The tests demonstrated it could be burned with the regular equipment then used on the boats for the navy oil, the object of the test being at that time to conserve the oil supply on account of the scarcity of tank steamers.

(A motion was made that the discussion be closed, the committee continued, and the questions raised further looked into for next year's report.)

W. J. Bohan (Nor. Pac.): Before closing that discussion, I would like to add to the motion that this committee give more attention to the cost of producing steam. The Fuel Association made a careful inquiry all over the United States on the cost of producing power by means of powdered coal, without a single answer giving the information on this important subject. There has been a good deal of enthusiasm about burning powdered coal, and there has been too much academic discussion on it. The railroads are interested in paying dividends and we want to know what it is going to cost to produce power with powdered coal. I know of one instance indirectly where powdered coal did not compare favorably with ordinary mechanical stoking on the large stationary plants. In order that the investigation be complete and satisfactory to the man who is going to spend money for his railroad, it is necessary that we know approximately where we are going to arrive. There, probably, will be little difficulty in the successful burning of powdered coal. That does not mean that the coal must be pulverized to the extent that some of its supporters recommend. It may be possible to develop the pulverizing of coal to such an extent that we can get practically the same results at much less expense. The art of burning powdered coal is a progressive one, and we should not take a broad jump on this any more than we should on any other important subject, without laying a more firm foundation. There may be some proofs that two hundred mesh coal is the best form in which to burn this fuel, but everyone does not believe that. We should commence to investigate generally on this subject. The question of burning powdered coal is not one that was originally considered for burning slack coal, but its greatest field probably is the burning of the lower grades of coal. It may not be generally known, but there is enough locomotive coal in the State of Montana to operate the five railroads that run in that vicinity for five thousand years. There is plenty of it up that way, and powdering may be the way to burn it, and if that is the way to burn it we would like to have the facts to substantiate it. In continuing this commitee I would suggest that they spend a good deal more time in determining this fact than has been spent by past committees. This committee should co-operate with the Fuel Association Committee.

Mr. Chambers: With the consent of the seconder, I will include the comparative costs in this motion.

The motion was then put to vote and carried.

Resolutions

Mr. Dunham then read a report on "Resolution, Correspondence, Auditing, etc.," as follows: "Whereas, the Railway Supply Men's Association have gathered together, for our benefit, the largest and most comprehensive exhibit of railway machinery and appliances ever collected at one time, have carried out such an acceptable program of entertainment for the members of the Section with their friends and families, and, without any confusion, have enrolled the largest attendance of any mechanical convention, and

"Whereas, The Atlantic City Hotel Men's Association, on short notice, have in their usual manner provided so acceptably for our welfare and comfort, and

"Whereas, The United States Railroad Administration has done so much to insure the success of this convention, and

"Whereas, The Executive Committee of the American Railroad Association have indicated their fullest approval of the

work of the section in convention, together with enthusiastic inspiration for future work, and

"Whereas, The meetings have been so ably planned and guided by the officers and the Secretary, be it

"Resolved, That the appreciation of Section III—Mechanical of the American Railroad Association be extended to the Railway Supply Men's Association, the Atlantic Hotel Men's Association, the United States Railroad Administration, the Executive Committee of the American Railroad Association and the Secretary and retiring officers of the section."

Signed, W. E. Dunham, B. P. Flory, H. L. Kleine, Committee.

A motion that the resolution be adopted was carried.

Mr. Barnum: I would like to offer a resolution as follows: "That Mechanical Section Number III of American Railroad Association recognizes the need of a research bureau to investigate questions of mechanical practice, which should have the co-operation of all the railroads, and urges the appointment, by the chairman, of a committee of eight to study the question and report at the next convention."

This motion was put to vote and carried.

Chairman: I appoint on that committee C. B. Young, of the Railroad Administration, Chairman, and the following gentlemen from the various regions: Howard Ingersoll, Eastern; C. E. Chambers, Allegheny; W. J. Small, Southern; A. Kearney, Southeastern; H. T. Bentley, Northwestern; C. E. Fuller, Central Western; and J. E. O'Brien, Southwestern. I would suggest that the secretary notify these gentlemen of their selection, and also mail to them a copy of the resolution just passed.

Unfinished Business

Mr. Chambers: A great many of our older members, no doubt, will notice the absence of J. Snowden Bell, who has been a regular attendant for a great many years. Since coming to Atlantic City I had a letter from his daughter advising me that he had been in the Western Pennsylvania Hospital, at Pittsburgh, since May 25th, because of injuries received from a fall and while he is getting along satisfactorily he wished that the convention might be notified as to the reason for his absence.

Chairman: As Mr. J. Snowden Bell has been a valued member of this association for many years, I believe it would be entirely proper for this association to send to him an expression of their sympathy, with a wish for his early recovery.

A motion to do so was carried.

C. E. Chambers then took the chair and introduced Scott H. Blewett.

Mr. Blewett: Mr. President, the members of the Mechanical Section are your friends, and that you are the presiding officer of this association is testimony of their appreciation of your abilities to lead men. Not all decorations are given for deeds of courage performed in the time of personal danger. Peace has its victory as well as war, and for such the medals are as honorable as the Congressional Medal, the Victoria Cross or the Croix de Guerre. This association, for your intelligent, earnest, faithful leadership, deems you worthy of wearing its distinguished service medal, and has graced me with the privilege of placing on your breast its president's rosette, evidencing to the eyes of the world their esteem of you. You will keep it with your treasures, and when you look upon it the faces of companions and the voices of dear friends will come up out of the past, looking and speaking confidence and respect.

Mr. Tollerton: After the many years that I have been attending these conventions and have listened to the presentation of the badges to the past presidents of both associations by our good friend Mr. Scott Blewett, and the beautiful way in which he presented them, it seems hard, indeed, to find words to properly reply. I prize very much the token that he has just pinned on my coat, and will endeavor to keep it for all time. In closing the last session of the American Railway Master Mechanics' Association, and as your last president, I want to wish to all the members and their families a prosperous and happy future. I thank you.

The chairman then introduced Roy V. Wright, Managing Editor of the *Railway Age*.

Mr. Wright: I suppose very few of us recognize the tremendous amount of work that is involved in getting up an exhibition such as we have out on the pier. People who have visited our great expositions say that nowhere is there a finer exhibit of mechanical contrivances than we have on this pier, and all of it is gotten up for just eight days. The Railroad Supply Manufacturers' Association is at work all year getting it in shape. Many of their members have to give a great deal of time to the job. It is tedious; it is hard work. And within the last three years they have had another mighty difficult problem. They did not know whether you were going to have a convention in 1917 until at the last minute it had to be called off. It was not until the armistice was signed last Novemmber that they knew that there was a possibility of having a convention this year, and yet we have here one of the greatest exhibits that has ever been made. I want to take this opportunity, in behalf of the Railway Supply Manufacturers' Association, in acknowledging to Mr. Walker, the president, our appreciation of the fine piece of work that he has done. I have been rather fortunate in being close to him in recent months. I know something of the problems he has had to contend with and some of the troubles he has had. We owe him a great debt of gratitude. Mr. Walker, in behalf of the Railway Supply Manufacturers' Association, I take great pleasure in giving you this badge, which I hope you will honor greatly, because it represents to you our feelings—feelings of the very kindest—for the splendid work that you have done this past year. We hope that you will prize this badge all the days that you live, and that they may be long.

Mr. Walker: The custom of presenting to the president of the Railway Supply Manufacturers' Association a past president's badge, must be the result of an inspiration in past years for the association to pin a badge on itself, because that is what you are doing. The president does not make the exhibit. The members make the exhibit; the committees make the exhibit, and perhaps you pick out the titular head and pin a decoration on him to gratify your own sense of appreciation for what you have done with your own efforts. There is no one knows better than I and the past presidents of our association how much the president has to depend on the committees, and how much the committees make for the success of the conventions. Your exhibit committee works days and nights in the preparation for the exhibition. Your enrollment committee, a difficult committee, which stands at the door and guards it, is your insurance that the proper people come in and the improper people do not. And they have been most efficient this year. Your transportation committee up and down the Boardwalk, a lonesome job, leaning up against the rail waiting until somebody comes along and asks for a chair—can you imagine a more inspiring way to spend the time at Atlantic City? And yet we ask men to do that, and unless they do it and do it right, your convention would not be a success. Your entertainment committee begins planning with the Committee on Arrangements six months before the exhibition opens, planning the entertainment that will fit in, that will attract the greatest number, that will keep the greatest number together the longest time, because one of the values of this convention is the association of man with man—your fellows that you do not see through the year but meet at the convention—you exchange ideas with them; you get new thoughts in connection with your business as well as with running a railroad.

I wonder if a large percentage realize what it means when I tell you that the value of the exhibit on this pier is approximately $4,000,000; that it costs the exhibitors, talking now with gross figures, approximately $750,000—three-quarters of a million of dollars—to put this exhibit on and take it away safely. The railroads pay the bill, every cent of it. But if the railroads use the exhibits, take advantage of the exhibits, they save, through the exhibitors, several times that amount, running well into the millions, so that if the exhibits are used, instead of an expense item for the railroads to meet, they become an economy. This year we have witnessed, I think, one of the greatest uses of the exhibits that we have had in years. I am not now talking about the size of the exhibits or the attendance at the convention; I am talking about the number of men, the number of people, in the booths getting information.

I have been president for three years. I heard for the last three years: "You will never have another convention." We not only heard it once, but we have heard it a hundred times. It certainly has affected me very deeply, the number of people that have expressed personally their appreciation for the work that has been done, and I have received that expression as I am receiving this—as an expression of appreciation for the men

who have held my hands up and helped me represent them seemingly satisfactorily.

E. S. Barnum: I have a little testimonial which the association desires to present to our past president, Mr. Clark. I wish to say to Mr. Clark that while he was elected president of the Master Mechanics' Association at the last meeting held in Chicago, it was not properly considered a convention, but it was an official meeting of the association and Mr. Clark was for the first part of the year the president of the Railway Master Mechanics' Association. For reasons which seemed good to him, he thought it advisable to resign the position, and yet the General Committee, in considering the work of the year, unanimously voted that because of the great value of Mr. Clark's work to the Association during the many years which he has been a member, and also for the work which he did during the first part of this year, they wish to present him with a badge showing their appreciation of that work.

Mr. Clark, it is with regret that the members of the Association have heard of your resignation from the presidency, and it is with still further regret that we railroad men have heard of your leaving the active work of the railroad business. We hope that possibly that may not be for good, but in any case we wish you the very best of success in whatever walk of life you may take up, and I trust that you will wear this badge as a testimonial of the appreciation of your fellow-members of the American Railway Master Mechanics' Association. I wish to convey to you the heartfelt appreciation of the members of the association for your good work and our best wishes for your future success.

F. H. Clark: If I had been on the General Committee at the time that this question of presenting me a badge came up, I should have tried to persuade the members that I was not entitled to the badge. I have, as Mr. Barnum has said, done more or less work for the association, but it has been gladly done. I have enjoyed it, and I do not think I am entitled to anything for it. As for the presidency of this Association, which I occupied for a period of six months or so, I think that is sufficient recompense in itself. I consider it a good deal of an honor to be the president of this Association. I do, however, appreciate the token which Mr. Barnum has presented to me.

I want to assure you all I shall always keep it and preserve it and try to remember, as I know I shall, the pleasant associations formed as a member of this Association and the various activities connected with that work.

Mr. Chambers: I want to say that with all of Mr. Clark's modesty about not being deserving of the badge, or something to that effect, he was an invaluable associate at the time he served as president, during the work which came up in connection with the change which was made from the Master Carbuilders' Association and the American Railway Master Mechanics' Association to the American Railroad Association, Section III, Mechanical. Had he been at the general meeting when this matter of presenting him with a badge came up, I would have seen that he was gotten out of the room before the vote was taken.

Before turning the chair over to your chairman, I want to take this opportunity to thank you all for your splendid cooperation, not only during my three years' occupancy of the presidency and chairmanship of the organization, but also at this convention. It has been very agreeable to all of us to hear the favorable remarks made about the convention from the start to finish, and the exhibits as well; there has never been a time when they were equalled. I have heard a great many times during the past two years that the conventions were dead, and we would never again see a big convention like those we witnessed here for several years. We are glad to know that at this convention we have had the largest attendance at the meetings and the largest exhibit that we have ever had.

Chairman Tollerton: You probably notice how easy I slip out of one job into another. I am sure that the assistance which I will receive from all the members of the association will make my task a very pleasant one.

I hope that we may be able to meet here twelve months from now, assuming, of course, that the next meeting will be at Atlantic City. That is entirely an assumption on the part of the Chairman, because it is a matter that the General Committee will have to settle.

Combustion Chambers

By F. F. Gaines

Chairman, Board of Railway Wages and Working Conditions, U. S. R. R. Adm.

A careful analysis of any locomotive boiler test reveals the fact that the firebox is the factor that limits both the boiler capacity and efficiency. In other words, boiler capacity and efficiency are limited by the amount of heat that can be liberated within the firebox, rather than by the amount of heat that can be absorbed by the heating surfaces.

When burning high volatile bituminous coal, more than 50 per cent of the heat generated is liberated by the burning of the combustible gases above the fuel bed, and in order to burn

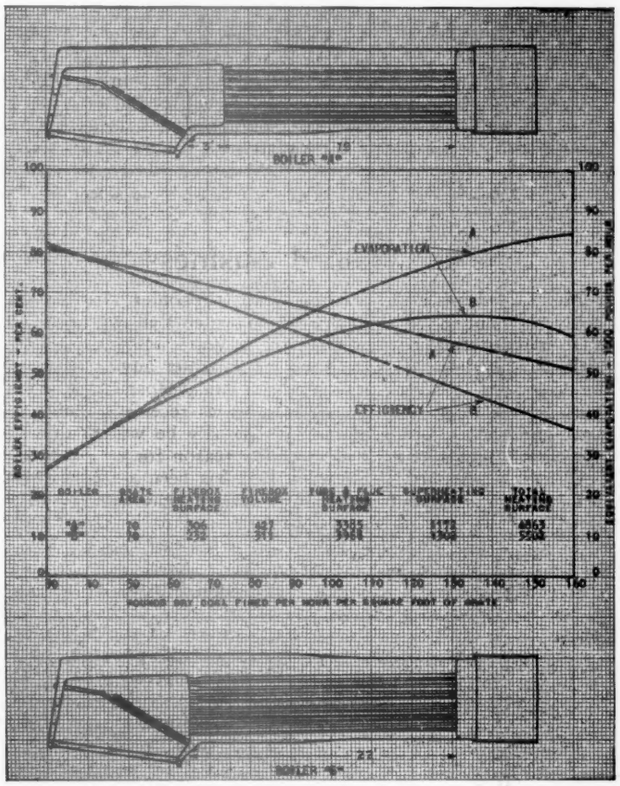


Fig. 1

these gases, it is necessary to have ample combustion chamber space or firebox volume.

The ratio of firebox volume to grate area has never received any careful or scientific investigation, but the value of firebox and combustion chamber volume is being demonstrated by the everyday operation of some 6,000 locomotives equipped with combustion chambers and is borne out by a few authentic tests.

The curves of Fig. 1 show the efficiency and capacity developed during tests of two Pacific engines equipped with boilers that were identical in every respect, except that one had a 36-inch combustion chamber and 19-foot flues, while the other had the ordinary firebox with 22-foot flues, the data as to the grate area and heating surfaces being shown in Fig. 1.

It will be noted that at low rates of combustion the capacity and efficiency developed by the two boilers are almost identical, but as the rate of combustion increased, the capacity and efficiency of the combustion chamber boiler showed a marked increase over that of the non-combustion chamber boiler, and while the non-combustion chamber boiler reached its maximum capacity at a rate of 130 pounds of coal per square foot of grate per hour, the capacity of the combustion chamber boiler continued to increase up to and beyond the rate of combustion of 160 pounds of coal per hour. At a rate of combustion of 120 pounds of coal per hour, the combustion chamber boiler showed an increase in efficiency and capacity of about 20 per

cent greater than that of the non-combustion chamber boiler, while at the maximum rate shown, the difference was more than 40 per cent.

The combustion chamber firebox had a volume of 427 cubic feet, or a ratio of firebox volume to grate area of 6.

The non-combustion chamber firebox had 311 cubic feet or a ratio of volume to grate area of 4.4.

At a rate of combustion of 120 pounds of coal per square foot of grate per hour, the combustion chamber boiler gave an equivalent evaporation of 75,000 pounds per hour, which is equal to 2174 boiler horse power.

Assuming that half of the heat was generated in the fuel bed and half above the fuel bed, we would have 1087 boiler horse power generated by the burning of combustible gases in a firebox volume of 427 cubic feet, or a generation of one boiler horse power per .4 cubic foot of firebox volume. At

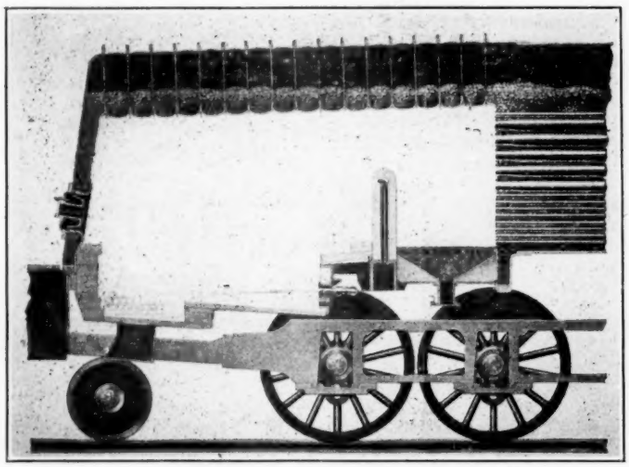


Fig. 2—Normal Grate Area = 70 sq. ft. Firebox Heating Surface = 307 sq. ft. Length of Combustion Chamber = 3′ 6″. Firebox Volume = 430 cu. ft. Flue Length = 18″. Flue Heating Surface = 3539 sq. ft. Superheater Surface = 886 sq. ft. Total Heating Surface = 4732 sq. ft.

the same rate of combustion, the non-combustion chamber boiler evaporated 63,000 pounds per hour and developed 1826 boiler horse power.

Assuming that the combustion conditions in the fuel bed were the same in both cases, we have 1826—1086=740 boiler horse power developed by the burning of combustible gases above the fuel bed of the non-combustion chamber boiler, which is equivalent to one boiler horse power per .42 cubic foot of firebox volume.

It will be seen from these figures that the increase in capacity and efficiency was in almost direct proportion to the increase in firebox volume. Of course, it goes without saying that there is a limit to the firebox volume needed for approximately perfect combustion, and when this limit is exceeded the capacity developed per cubic foot of volume will begin to fall off.

Increasing the firebox volume by the use of combustion chambers can only be accomplished by reducing the flue lengths and sacrificing flue heating surface, but it is a well-known fact that the additional firebox heating surface so gained has a much higher value per unit of area than the discarded flue heating surface, and while accurate tests are necessary to develop the absolute values of the different heating surfaces, the fact remains that boiler capacity and efficiency depend more upon efficient combustion than upon mere area and extent of heating surface.

The over-all boiler efficiency of the combustion chamber boiler referred to above varied from 82 to 51 per cent, and the furnace efficiency ranged between 97 and 66 per cent, while the heating surface efficiency ranged from 97 to 93 per cent.

Firebox volume is as essential in oil burning service as in bituminous coal burning, for in the former all of the heat is liberated by burning fuel in suspension. Fig. 2 shows an oil burning firebox of a Santa Fe type engine equipped with a Gaines combustion chamber. This boiler had 307 square feet of firebox heating surface, 3539 feet of flue and tube heating surface, and 886 square feet of superheating surface, or a total of 4,732 square feet with a grate area of 70 square feet and a firebox volume of 430 cubic feet. While burning oil under test at a rate of 4,000 pounds per hour, this boiler developed 2,000 boiler horse power, or 4.6 boiler horse power per cubic foot of firebox volume with an over-all efficiency of 85 per cent, which approximates the theoretical limit.

There is but little data available on combustion chamber tests in oil burning service, but that quoted is sufficient to give an idea of the value of combustion chambers in such service.

There are in use some 6,000 locomotives equipped with combustion chambers, of which 1425 are the U. S. Government standards and 460 are of the Gaines type. These combustion chambers range in length from 18 in. to 11 ft. and are used in conjunction with flues varying in length from 9 ft. to 25 ft. It is evident from these figures that there has been no logical method of procedure followed in proportioning combustion chamber and flue lengths, and there is room for a lot of scientific investigation to determine the correct ratios between firebox volume and grate area, and between firebox heating surface and flue heating surface. It is also desirable to arrive at some correct understanding as to the value of firebox heating surfaces and flue heating surfaces and the arrangement and location of heating surfaces, such as will give the maximum evaporation and efficiency per unit of surface.

Extensive tests have been carried out by the Bureau of Mines at its Pittsburgh laboratories in trying to determine the ratio of furnace volume to grate area for the different kinds of coal used in stationary service. These tests show that in order to reduce the heat loss due to unburned gases to 2 per cent, it was necessary to have the ratio of furnace volume to grate area about 13 to 1 when burning Illinois coal at a rate of combustion of 60 pounds with a 25 per cent excess of air. Under the same conditions, Pittsburgh run-of-mine coal required a surface volume of ten times the grate area, while Pocahontas low volatile coal required a volume five times the grate area. These tests are not strictly comparable to locomotive practice for the reason that in the latter much higher rates of combustion prevail, and the excess air supply is generally lower than that mentioned.

Under these conditions it might be necessary to have a higher ratio of volume to grate area than those required in stationary service, in order to secure approximately perfect combustion of the gases.

Fig. 3 shows a Mallet firebox with a grate area of 80 square

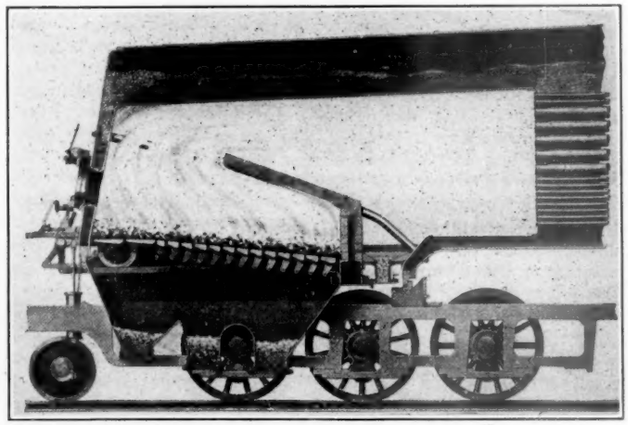


Fig. 3—Grate Area = 80 sq. ft. Firebox Heating Surface = 407 sq. ft. Firebox Volume = 570 cu. ft. Combustion Chamber Length = 7 ft. Length of Flameway from Center of Fuel Bed to Flue Sheet = 18 ft.

feet, 407 square feet of firebox heating surface, firebox volume of 570 cubic feet and a flameway 18 feet in length from center of fuel bed to flue sheet. In this firebox, the ratio of volume to grate area is about 7 and this probably represents the maximum at this time, with the exception of a locomotive now building which with a firebox volume of 860 cubic feet and a grate

area of 112 square feet, has a ratio of volume to grate area of 7.7.

If the tests on the stationary furnace referred to can be used as a criterion, it is apparent that our best designs of modern fireboxes are still shy in flameway and volume and that there is much room for investigation and improvement in this direction.

Future developments and improvements in the art of burning coal in the locomotive firebox will probably depend to a large extent upon the changes made in the design and proportions of the firebox itself, and it is in this direction that we must look for innovations that will successfully meet the constantly increasing demand for boiler capacity and efficiency.

As an indication of this, we might mention that while the oil burning locomotive referred to developed 4.6 boiler horse power per cubic foot of firebox volume, and the coal burner developed 2½ boiler horse power per cubic foot of firebox volume, stationary power plants are being designed and built for burning coal in suspension with furnaces of such size that the desired boiler capacity can be developed at a rate of ½ boiler horse power per cubic foot of furnace volume.

No mention has been made of the effect that the istroduction of combustion chambers has upon boiler maintenance; but it is a well-known fact that short flues give less trouble and fewer failures than long flues, and that moving the back flue sheet forward and away from the zone of high temperatures in the firebox materially reduces trouble due to flue leaks and failures.

Viewed from any angle, the combustion chamber firebox is apparently superior to that of the non-combustion chamber type; but there is a woeful lack of correct and authentic information concerning this most important subject, due to the fact that such knowledge can only come through a correct interpretation of experimental facts.

Appreciation from the Ordnance Department

MAJOR E. D. CAMPBELL, Railway and Seacoast Section, Artillery Division, Ordnance Department United States Army, who made the address on "Railroad Artillery" on Monday evening, received the following communication from C. C. Williams, Major General of the United States Army, Chief of Ordnance, conveying appreciation to the manufacturers and railroad representatives at Atlantic City:

"I am glad to have this opportunity to express the thanks and appreciation of the Ordnance Department for the noble efforts of the manufacturers and railroad representatives here assembled which resulted in the splendid production of ordnance material.

"Your assistance was not only invaluable in manufacturing ordnance, but your hearty co-operation in design, research and development of all kinds of equipment was of inestimable value.

"It is due largely to the high purpose and patriotic efforts of the manufacturers such as the American Car and Foundry Company and the railroads that a surprisingly quick end came to the great war."

Purchasing Officers Visit Convention

WHEN R. H. AISHTON, the newly elected president of the American Railroad Association visited Atlantic City last week, he was so impressed by the exhibits that he wired H. B. Spencer, director of the Division of Purchases, U. S. R. R. Administration, suggesting that he ask the purchasing officers within reasonable distance of Atlantic City to arrange to visit the exhibits. Mr. Spencer made this suggestion to the regional directors and through them to the federal managers. The result was that a very large number of the purchasing officers visited the convention before its close.

Registration, American Railroad Association, Sec. III, Mechanical

Bemet, J. J., Frd. Man., N. Y. C. & St. L.
Bennett, R. G., A. E. M. P., Penn., Chalfonte.
Brady, J. E., Asst. M. M., B. & O., Schlitz.
Crawford, C. W., Chrmn. Gen. Com., U. S. R. A.
Darlow, A. M., Fed. Mgr., B. & S., Chalfonte.
Deeter, D. M., M. M., P. & R.
Duval, J. E., Genl. Supt. Car Serv., Grand Trunk.
Edwards, J. S., M. M., Newberry & Laurens, Continental.
Evans, G. E., Staff Officer Oper., L. & M.
Galloway, W. S., M. M., B. & O.
Herlihy, J. J., Asst. M. M., B. & O., Schlitz.
Hines, J. P., M. M., B. & O.
Huber, H. G., Asst. Eng. M. P., Penn., Chalfonte.
Kendall, W. C., Mgr. Car. Serv. Sec., U. S. R. R. A.
Lanza, Coetano, Galen Hall.
Leach, W. B., Marlborough.
Linderman, F. A., Dis. S. M. P., N. Y. C., Pennhurst.
MacFarland, H. B., E. T., A. A. & S. F., Traymore.
Marsh, F. E., M. M., N. Y. P. & N.
Mengel, J. C., M. M., Penn.
Moll, George, R. F. E., P. & R., Netherland.
Ott, Wm. B., M. M., Penn.
Park, W. L., Fed. Mgr., C. G. W.
Pearson, E. J., Fed. Mgr., N. Y. N. H. & N.
Platt, J. C., Hunt-Spiller Mfg. Co., Dennis.
Rice, W. L., Supt., N. & C. S. P. & R., Monticello.
Shaeffer, C. M., Gen. Supt. Transp., Penn.
Simpson, G. E., Gen. Supvr. Transp., C. M. & St. P.
Smock, F. A., M. M., Penn.
Stevens, Geo. W., Fed. Mgr., C. & O., Marlborough.
Tate, M. K., Mgr. Service, Lima Loco. Works, Chelsea.
Taylor, G. W., Staff Officer Transportation, Southern.
Wagner, J. A., Genl. Mgr., Des Moines Union.
Wanamaker, E., E. E., Rock Island, Haddon Hall.

Special Guests

Atkinson, H. C., M. P. Dept., P. & R.
Atkinson, W. S., Pur. Agt., K. C. S., Traymore.
Bonfield, Chas. P., Car Fore., B. & O., Bouvier.
Bernal, Angel, Ch. Clk. to S. M. P. & M., Southeastern Lines of Mexico, Marlborough.
Bowler, Roland T. E., Supr. Tool Equip., B. & O., Craig Hall.
Boyer, John O., Road Fore. Eng., P. & R., Tennessee.
Braden, Wm. F., Welfare Agt., B. & O., Schlitz.
Burnham, M. G., Eng. of Tests, N. P., Traymore.
Caley, G. W., M. M., N. Y. C. & H., Fredonia.
Campbell, Johnston, Supt., L. V.
Camder, Wm. A., Dist. Elec. Super., B. & O., Bouvier.
Cathcart, H. W., Fuel & Loco. Inspr., P. & R.
Church, L. H., Loco. Insp., U. S. R. R. Ad.
Clarkson, A. J., Eng., N. Y. C.
Clemmitt, J. H., Pur. Agent, N. & W.
Conley, A. J., R. Fore. of Engines, Staten Island.
Cope, D. E., M. M., B. R. & P., Continental.
Dailey, Jerry, Asst. Fore. & Boiler Insp., C. R. R. of N. J., Conway.
Davis, A. C., M. M., Penn.
Dillon, H. W., Insp. Pur. Dept., Pa., Princess.
Doke, G. E., Insp., N. Y. C. Lines, Traymore.
Doyle, M. J., Reporter, A. R. A., Craig Hall.
Dravo, H. D., Asst. Rd. For. of Eng., N. Y. P. & N.
Edmunds, J. B., Trav. Sec. to Fed. Man., C. & O.
Eggleston, M. O., Rd. For. of Eng., P. & R.
Ehrenfeld, F., Supervisor, Retired, Pa.
Ely, Jacob W., Air Brake Supr., P. & R.
Fanaday, C. L., Asst. P. A., Penn.
Feehan, Benj., Asst. Fore., C. R. R. of N. J., Conway.
Fillmore, Jacob, Machinist, W. J. & S.
Filskov, H., Asst. Eng., Raritan River, Worthington.
Floyd, James F., Southern, Marlborough.
Foertsch, T. A., Fore., P. & R.
Force, Lawson H., D. L. & W., Pennhurst.
Force, N. J., Eng. Test., D. L. & W., Pennhurst.
Garcelon, H. I., Asst. Engr. of Tests, B. & O.
Glaser, Sidney, Insp. Car. Dept., C. & I. H., Espinlade.
Godard, E. E., Asst. Eng., Elec. Car Htg., Pa., Dennis.
Grabfelder, J., Insp., W. J. & S. S.
Griswold, W. W., Pur. Agt., W. & L. E., Marlborough.
Hardy, W. E., Gen. Fore., C. R. R. of N. J., Conway.
Heald, W. E., Const. Ele. Dept., B. & O.
Heazlitt, B. Y., P. A., Kentucky & Indiana Term.
Heinbach, W. F., For., P. & R.
Henry, Frank, Eng. of Tests, B. R. & P., Traymore.

Higlemeier, A. F., Gen. Boiler For., B. & O., Schlitz.
Hibbs, C. E., Asst. Rd. For. of Eng., Penn., Osborne.
Hogan, Francis, Road For., P. & R.
Howe, John, Supt. Shops, B. & O., Marlborough.
Jamison, William D., Draftsman, P. & R.
Jones, G. J., Gen. Boiler For., B. & O., Grand Atlantic.
Jones, W. T., Asst. to Eng. of Tests, N. Y. N. H. & H. R. R.
Kahler, C. P., Elec. Engr., Oregon Short Line, De Ville.
Keller, R., For., C. R. R. of N. J.
Kershaw, W. C., Fore., Pa., Traymore.
Kimball, John A., Asst. Rd. For. of Eng., P. & R.
Klingeman, J. D., Asst. Rd. For. of Eng., Penn.
Kissinger, Frank H., Insp., P. & R., Chalfonte.
Kleinkauf, E. G., M. M., L. V., Surf.
Koch, Philip, For. Eng. House, P. & R.
Kofammann, K. E., Test Dept., Penn., Kentucky.
Lagrange, Fred A., Tech. Insp., Argentine Government Rys., Traymore.
Lanza, Gaetana, Galen Hall.
Lacy, A. B., Pur. Agt., Virginian.
Lenderking, W. D., Safety Agt., B. & O., Schlitz.
Logue, H. A., Engr., West. Maryland, Breakers.
Lukens, H. A., Asst. P. A., Penna.
Lunn, E., Ch. Elec., Pullman Car Lines, Marlborough.
Leppington, W., Asst. Fore., C. R. R. of N. J., Sterling.
Markel, Chas. T., Ch. Loco. Const. Insp., U. S. R. R. A.
McCaffrey, J. A., Road Fore., S. I.
McCann, C. E., M. M., B. & O.
McClellan, R. D., Gen. For., L. V.
McConnell, Wm. H., Clerk M. P. & R. E. Dept., P. & R.
McCune, W. H., M. M., M. K. & T., Breakers.
McGinness, G. T., Secy. to Supt. Shops, B. & O., Wiltshire.
McPhail, O. G., M. M., A. B. & A., Sterling.
Martin, John J., R. H. Fore., C. R. R. of N. J., Conway.
Masson, Capt. C. H., Eng. Corp., U. S. A., Traymore.
Miller, B. F., M. Painter, D. L. & W., Osborne.
Milton, J. H., Supt. C. D., C. R. I. & P., Chalfonte.
Moor, L. D., Engr., M. P., Osborne.
Morgan, J. C., Safety Agt., B. & O., Schlitz.
Munster, A. W., Reg. Pur. Bd., U. S. R. R. A., Breakers.
Nichols, J. H., Gen. Store., N. Y. C. & St. L., Traymore.
O'Donnell, John J., Gen. Fore., L. I., Dennis.
Oplinger, H. E., Gen. Fore., Atlantic Coast Line, Chalfonte.
Otto, C. A., Asst. Gen. Mat. Agt., Pa.
Owen, A. E., Equip. Agt., Pa.
Parker, R. J., Gen. Mgr., A. T. & S. Fe., Shelburne.
Parker, Wm. A., P. A., B. & B., Traymore.
Pastorius, D. B., Sup. Elec. Car Ltg., Penn., Galen Hall.
Perrin, Ernest, U. S. Official Representative of the Lyons Fair, Lyons, France.
Patten, G. Fred, Ch. Clk. to Gen. Supr. Car Repr., U. S. R.
Patenhall, F. P., S. E., B. & O., Breakers
R. A., Miller Cottage.
Pegran, R. B., Genl. Pur. Agt. Southern, Traymore.
Phillips, C. K., Examiner Div. 41, U. S. Patent Office, Jackson.
Pickard, F. C., M. M., D. L. & W., Traymore.
Pizzorno, V., Pres., Italian State Rys. Com., Marlborough.
Pyle, Leslie R., International Ry. Fuel Assn., Ambassador.
Quinn, M. A., R. H. F., D., L. & W., Richmond.
Ramond, Albert, French High Commission, Traymore.
Rausch, Edw., Loco. Insp., U. S. R. R. A.
Reichard, H. W., Road Fore. of Eng., R. V.
Reidinger, L. P., Fore. Car Insp., W. J. & S. S.
Reynolds, H. W., Mech. Insp., N. & W., Louella.
Riley, J. L., M. M., C. St. P. M. & O., Sterling.
Royer, A. C., Pur. Dept., Penn.
Ramond, Edmond, French High Commission.
Reardon, F. E., Supt. of Stores, D. & H. Dennis.
Rees, H., Asst. M. M., B. & O., Grand Atlantic.
Reynolds, D. E., Ch. Clk. Pur. Dept., B. & L. E., Traymore.
Richetson, W. E., Ch. of Eq. Div., N. Y. C.
Rickford, S. A., M. M., N. Y. C., Chelsea.
Roach, C. E., Insp., C. R. I. & P.
Roeser, Elmer J., Draftsman, P. & R.
Roderick, M. B., Insp. T. & M., Erie, Traymore.
Rule, Geo., Eng., B. & O., Bartram.
Rush, R., Genl. Hdlt. Insp., N. Y. N. H. & H.
Ryer, F. A., Pur. Agt., B. & A., Shelburne.
Ryerly, Wm. S., Asst. Supt. Shops, B. & O., Schlitz.
Saabye, H. J., Act. Pur. Agent, B. & W.
Sapia, Radup, Central Argentine, Dalso.
Scatchard, H., Gen. Strkpr., N. W.
Scatchard, H. F., N. & W.
Shand, A. C., Ch. Eng., Penn.
Shay, J. M., M. M., B. & O., Majestic.
Shea, Frank, Boiler Insp., N. Y. N. H. & H.
Sheehan, J. E., Gen. Car Insp., N. Y. N. H. & H., Osborne.
Shelton, F. M., Supr. Loco. Sup., D. L. & W., Raleigh.
Shepard, C. E., M. P. Insp., B. & O., Schlitz.
Shugers, Geo. C., Trav. Fir., P. & R.
Sisco, G. E., M. M., Penna., Haddon Hall.
Smith, George W., Asst. Gen. For., P. & R.
Smith, W. D., Shop Supt., C. & E. T., Arlington.
Smith, Asst. Erect. Shop Fore., B. & O., De Ville.
Spofford, Capt. H. N., Eng. Corps, U. S. A., Traymore.
Stahl, E. C. N., Insp., N. Y. C.
Stahl, J. J., Shop Eng., Southern, Glaslyn Chatham.
Stewart, C., S. S., B. & O., Schlitz.
Stewart, T. R., S. S., B. & O., Schlitz.
Silvestri, Ing. Cav. Vittorio, Principal Engineer, Italian State Rys., Marlborough.
Simpson, D., Mach. Shop Foreman, P. East Lines, Strathhaven.
Simpson, G. R., Primary Examiner, Patent Office, Wiltshire.
Slenker, C. A., For. Blksh., Long Island. 12 Ohio Ave.
Son, Frank P., Asst. to Pres., Copper Range.
Sprowl, S. C., Supt. of M. P., Atl. Coast Line, Chalfonte.
Stackhouse, R. J., Genl. Storekeeper, P. & R., Craig Hall.
Stadelman, J. H., Asst. Eng., Penn. E. L.
Stier, J. E., Draftsman, B. & O., Pennhurst.
Stone, W. S., Grand Chief, B. of L. E., Alamac.
Strohmer, J. L., Secy. to Supt. M. of E., B. & O.
Stockton, C. H., R. M., Raritan River, Worthington.
Stockwell, F. L., M. M., S. A. L., Berkshire
Stofflet, H. A., E. E., P. & R., Bouvier.
Stuart, R. T., M. M., Raritan River, Worthington.
Subrie, Norman, Travel. Eng., Penn., Continental.
Sullivan, J. S., Fore. Black. Col. Shop, Pa. Lines West, Ambassador.
Surrie, Norman, Pa.
Sutherby, A., M. M., Erie, Monticello.
Sweetman, E. M., M. M., Southern, Osborne.
Sykes, L. Gen., Foreman, P. & R., Strand.
Tencey, S. R., Supt., U. P., Shelburne.
Thayer, J. S., Material Insp., B. & O., Clarindon.
Terwilliger, G. E., Genl. Air Brake Insp., N. Y N H. & H, Haddon Hall.
Thomas, John H., C. of N. J., Louvan.
Thompson, C. E., Gen. Fore. Car Shops, Pa.
Thompson, F. V., Elec., P. & R.
Thompson, J. G., M. M., L. V., Surf.
Thornely, E. W., Reg. Supvr. of Stores, Allegheny Reg.
Thorpe, W. C., Chf. Loco. Insp., Penna., Harris Apts.
Thwaites, D. G., Insp., Pa., Traymore.
Toomey, T. H., Gen. For., Penn.
Topp, C. E., M. M., E. J. & E.
Torback, F. S., For., B. & O., Wittle.
Tiley, George E., Supt. Tank Car Eq., Crescent Tank Line, Lexington.
Trego, J. G., Asst. Fore. Eng., Penn., Eaton.
Turley, William, Shop Supt., Kan. City South., Chalfonte.
Urtel, E. J., Pur. Agent, B. & S., Chalfonte.
Utaka, Y., Agt. Japan Gov. Rys., Marlborough.
Van Derbogart, James, Gen. Fore., N. Y. C., New Biltmore.
Van Gundy, C. P., Chief Chem., B. & O., Dennis.
Voigt, A. E., Car. Ltg. Eng., Santa Fe, Marlborough.
Walker, E. B., Elec. Eng., Canadian National, Traymore.
Walker, J. E., M. M., I. C., Ambassador.
Walsh, M. F., Research Com., U. S. Shipping Bd., Traymore.
Wardlaw, J. W., G. E., Central Vermont, Chelsea.
Warwork, W. J., C. C., N. Y. C., Traymore.
Watkins, Thomas, Gen. For., P. & R.
Webb, M. L., Asst. Secy. to Dir. of Oper., U. S. R. R. A., Miller Cottage.
Webb, E. R., Div. M. M., M. C., Haddon Hall.
Webb, T. H., For., S. A. L., Osborne.
Weedom, R. E., Supt. Roadway Shop, Southern, Netherland.
Weeks, John, Pres, Norwood & St. Lawrence, Dennis.
Wellman, I., M. M., A., T. & S. F., Marlborough.
Whitehurst, S. A., M. M., Cent. of Ga., Schlitz
Widmaier, J., W. J. & S. S.
Wilson, G. M., Supt. M. P. Shops, G. T. R., Marlborough.
Wilson, D. C., Elec. Eng., C. of Geo., Osborne.
Wilson, D. H., Shop Supt., F. E. Coast, Sterling.
Williams, Capt. Cyril, Insp. Eng., South African Rys., Marlborough.
Winfield, J. H., Gen. Insp. M. P. Dept., Erie, Traymore.
Wright, C. W., Master Carpenter, L. I.
Wright, J. D., Gen. Fore. Painter, B. & O., Strand.
Wright, N. R., Asst. M. M., Lehigh & New England.
Young, J. H., Senior Asst. Dir. of Oper., U. S. R. R. A., Haddon Hall
Young, Jas., Jr., Asst. Eng. M. P., Pa.
Yost, James F. S., R. F. E., P. & R.
Zeigler, C J., Ch. Elec., Florida East Coast, Galen Hall.

Conventionalities

President Carr, of the Railway Supply Manufacturers' Association, has asked John C. Khuns, manager railroad sales, the Burden Iron Company, Chicago, to take the chairmanship of the Transportation Committee for next year. Mr. Kuhns has accepted.

Secretary George B. McGinty, of the Interstate Commerce Commission, who has been attending the convention, became ill after he arrived and was confined to his room for a while. He is feeling much better now and has been attending the sessions of the convention and inspecting the exhibits.

In the photograph of Franklin Hess, son of George F. Hess, mechanical superintendent, Kansas City Southern, accompanied by Ellsworth L. Mills, of the Air Reduction Sales Company, which appeared in the *Daily* for Wednesday, June 25, a typographical error was responsible for the writing of the company's title as American Reduction Sales Company. It should have read Air Reduction Sales Company.

Mr. and Mrs. Harry W. Frost have had as their guests, since they have been at the convention, their son, Harry, Jr., and their son-in-law and daughter, Mr. and Mrs. Webb C. Artz. Mr. and Mrs. Artz live in Philadelphia. During the war Mr. Artz was in the motor transport service of the army. Harry, Jr., is a lieutenant in the navy, having recently received announcement of his promotion to first lieutenant, and is stationed at present at the Brooklyn Navy Yard.

An H. B. O.
With a party of 4,
Strove motoring hither
Till She ran no more.
Said H. B. O.
When he left Flushing,
"Did not expect to do much pushing."
Oh! H. B. O.
You sure should know,
That trip would have been neater,
Behind a superheater.

Colonel C. H. Crawford, who has been attending the convention, will leave on July 1 for Rio de Janeiro, Brazil, where he will go as manager for the Baldwin Locomotive Works. The Baldwin works are establishing over a dozen branches in foreign countries, and the manager will go supplied with a complete library of catalogues and books regarding equipment and supplies produced in the United States, whether those of the Baldwin or other companies. Col. Crawford formerly was assistant to the president of the Nashville, Chattanooga & St. Louis. During the war he was in the Engineer Corps, and was to have gone to Europe to assist Samuel M. Vauclain, now president of the Baldwin Works, in carrying out this country's extensive program of tank production. Col. Crawford was actually on the Adriatic in New York harbor ready to sail, when the armistice was signed.

The losses by fire in the United States and Canada during the month of May, as compiled from the records of The Journal of Commerce, aggregated $16,516,300, as compared with $2,545,900 in May, last year.

The Man Who Saw

"Louder, Please!"

"Say," said the locomotive man from the Mormon capitol, "do you know what that meeting in the Convention Hall reminds me of?"

"What?" said The Man Who Saw, who was sure that the big westerner had a "good one."

"It reminds me of the delegation of boilermakers who 'waited on' the superintendent of a road. They were courteously received and stated their case for more pay, shorter hours, etc.

"The superintendent regretfully detailed his reasons for not being able to raise their pay and finished his address in 4½ hours flat.

"Just as he finished, the chairman of the delegation put his hand to his ear and said, 'how much did he say we got?'"

"Comers"

"Never run a one-man show."

The mechanical engineer of a prominent eastern road was explaining his record of success in response to the questions of The Man Who Saw.

"Train two of your best men for your own job. Put the ability of one against the other. When you are away, entrust the duties of your office to the one who seems to be able to assume them with the least swelling of the head.

"Encourage them all to add to their study of details by absorbing some of the bigger things. Try to create in them an interest in what the road is doing—whenever you can send them out on the line.

"Have them meet the other men from other departments when possible, so that the interest in their work will be tempered with a familiarity with the real object we all seek to attain—to safely haul as much as we can, as economically as possible."

Get Acquainted

The Man Who Saw 15 unexpected Latin-American visitors here this year begs to call attention to the significance of this event. Evidence of the importance of the Latin-American field for railway supplies is furnished in the announcement by a prominent locomotive works of the opening of Argentinian and Brazilian branches in addition to extended activities in Europe, Asia, Australia and Africa.

The Man Who Saw finds a slowly awakening interest among railway supply men in this development. Here and there he finds a manufacturer with vision who has studied or is quietly investigating South American possiblities on his own initiative. And he does not wish to urge the expenditure of a heavy appropriation which has so often accompanied the ill-advised excursion of a well-meaning but innocent explorer of the Latin-American mart. Rather he would suggest discussion and action which might lead to the attendance of as many influential officers of Latin-American railroads, sugar mills and other enterprises as can be induced to attend the next mechanical convention.

Why not tackle this problem now? The Man believes

that a sincere effort in this direction will not fail to bring forth fruits, of which, perhaps some day, we may well be proud.

The Trackless Train

The Man Who Saw feels that attention should be directed to the fact that the "greatest convention" is marked by the introduction of a new era of transportation in and around the factory and machine shop.

The setting up of exhibits from one end of the Pier to the other, owes their rapid completion to the new development—the "trackless train."

Man savers, time savers, money savers—these miniature motor trucks are said to be displacing the old hand truck about as fast as they can be manufactured. The popular type propelled by an electric motor which derives its power from a storage battery can be seen handling formerly impossible loads in modern shops. Some haul three or four trailers and negotiate crowded aisles and sharp corners with perfect ease.

Internal combustion tractors of the small type on the caterpillar or "tank" principle are likewise coming to the front and are making good out of doors; some of them equipped with a belt pulley find themselves trusty guardians of the power breakdown where they are able to slip in next to a disabled machine and furnish emergency power.

The Man Who Saw believes that the advice of one of his friends, an enthusiast on this subject, is well worth reading: "If you are thinking of putting these tractors into your works, analyze your problem from all angles; balance the desirability of the use of electricity vs. gasoline, visit a big plant and see what they are doing with it, then study the different types which are offered and choose for your needs."

Umbrellas and Soft Plugs

He had Asia's number. He could tell what province a Korean came from by the shade of blue on his shirt. He had watched them build and trade and his admiration of the Mongolians' methods was unqualified. There were, however, some phases of their reasoning which he could not explain and the pioneer of American machinery in the Far East proceeded to illustrate.

The Man Who Saw drew nearer to get the slant on the Asiatic from one who seemed to know.

"We were walking on one of the principal streets of Seoul accompanied by an Englishman and an enterprising Jap. It was the hour for trade. Push carts, bundles and junk of various descriptions seemed bound in a common direction. Among the throng appeared a picturesque old Korean and he carried two home-made umbrellas.

"'But, I say, why does he carry two?' inquired the Briton.

"'You ask him," said I to the Jap.

"The Jap blocked the path of the tradesman, asked his question and returned to make his report.

"'He says,' said the Jap, 'that he carries two so that in case he loses one he will still have the other.'"

* * * * * * * * *

"'Two years elapsed and I found myself in the company of the same enterprising Jap. He had come to inspect a shipment of locomotives for his company and was quite insistent.

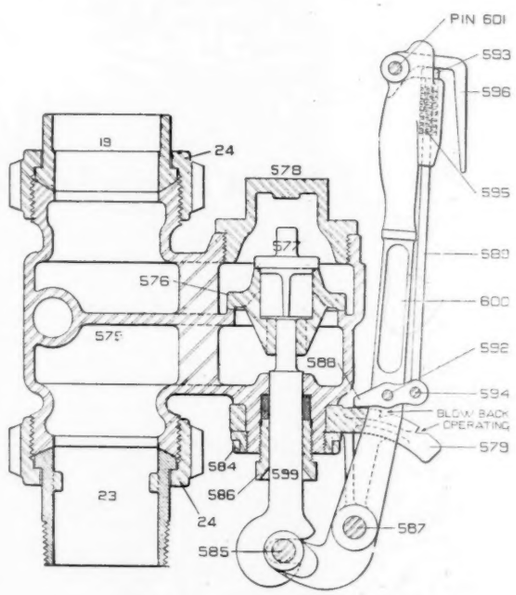
"'But the specifications only call for one soft plug in the crown sheet,' I protested.

"'Ah, yes, I know,' said the Jap, 'but you remember the Korean and his two umbrellas? We must have the two plugs—if one goes bad we have the other one to go good.'"

Balanced Lever Starting Valve for Non-Lifting Injectors

A LEVER STARTING VALVE, which will remain tight in service as long as needed, is being shown by William Sellers & Co., Inc., Philadelphia, Pa. It is known as style VC. It is radically different from the older forms in which the pilot and main valves are connected to and operated by a horizontal stem and with which it is difficult to maintain the valves in alignment.

The "VC" style has a main body with a supplemental steam receiving chamber containing two loosely guided flat seated checks, raised serially by a vertical stem. The valve is reseating, self-grinding and remains tight under the severe service to which valves of this type are subjected. It has a further advantage of safety, because the valves cannot be jammed open. As the steam pressure is always on top and the lift is vertical, the tendency is naturally to return to their seats. For this reason it is necessary that a latching device be provided



Balanced Lever Starting Valve

for holding the valve in operating position; this consists of the usual form of notched quadrant and tripping device for the latch. An initial notch is placed in the quadrant so that the valve may be held partially open, permitting the required amount of steam to warm the water in the tank during the cold weather. When the valve is placed outside of the cab a special notched hand pull is provided, which not only locks the valve wide open in operating position, but also permits eight positions of the valve when used as a heater, so that any required amount of steam can be blown back into the tank.